ABECO
ASSOCIAÇÃO BRASILEIRA DE CIÊNCIA ECOLÓGICA E CONSERVAÇÃO

Natureza & Conservação
Brazilian Journal of Nature Conservation
Supported by Boticário Group Foundation for Nature Protection
http://www.naturezaeconservacao.com.br

Research Letters

Participative mapping of cultural ecosystem services in Pedra Branca State Park, Brazil

Fernando P. Ribeiro[a,*], *Katia T. Ribeiro*[b]

[a] *Conservação Internacional Brasil, Rio de Janeiro, RJ, Brazil*
[b] *Coordenação Geral de Pesquisa e Monitoramento, Instituto Chico Mendes de Conservação da Biodiversidade, Brasília, DF, Brazil*

ARTICLE INFO

Article history:
Received 9 July 2015
Accepted 21 September 2016
Available online 18 October 2016

Keywords:
Cultural ecosystems services
Geographic information system
Immaterial benefits
Protected areas management
Public participation

ABSTRACT

Many studies have identified the benefits conferred to urban citizens by the relationship with protected natural areas, but in Brazil, with many important urban green areas, studies about how these benefits are perceived and managed are still quite rare. This study aimed to evaluate the immaterial benefits of Pedra Branca State Park, the largest urban park in Brazil, located in Rio de Janeiro, the second most populous Brazilian city. Using participative GIS procedures, we mapped and assessed the perception of 68 users, among visitors, residents and park staff, about seven cultural ecosystem services: aesthetic values, social relations, recreation & ecotourism, knowledge systems & educational values, cultural heritage, cultural diversity, spiritual & religious values. Results indicated that the park offers significant immaterial benefits to respondents, with aesthetic values and recreation & ecotourism being the most frequently perceived. Differences in perceptions between the three groups of users were found. Possible implications of these results for park management, mainly visitation and conflicts with residents and neighbors, are discussed.

Introduction

With 54% of global population living in cities (United Nations, 2015), the world is undergoing a rapid process of urbanization (Bratman et al., 2015) with strong implications for human health (Brown et al., 2014). In Brazil, 84% of the population live in cities (IBGE, 2010) and the expectation is an increase in this proportion in the next years as in the rest of the world (United Nations, 2015). As the urbanization expands at the expense of natural spaces, which are in turn of strategic importance for the quality of life, people spend less time in regular contact with natural environments resulting in poor health and decrease in well being (Chiesura, 2004; Brown et al., 2014; Bratman et al., 2015).

In the urban context, the importance of natural areas to the physical and mental health of inhabitants has been

* *Corresponding author.*
E-mail address: fribeiro@conservation.org (F.P. Ribeiro).
http://dx.doi.org/10.1016/j.ncon.2016.09.004

demonstrated in many works (ex. Godbey et al., 1992; Chiesura, 2004; Brown et al., 2014), from descriptive studies to those with a strong statistical approach such as Maas et al. (2006), who evaluated the relationship between well-being and the proportion of green areas, and Bratman et al. (2015), who pointed out the benefits of nature experience on affect and cognition. Other studies have shown the relevance of PA's, in general, to the protection of cultural, historical, and existential values of a population (Fadini, 2005). More introspective benefits can also be associated with such areas, including a sense of challenge and privacy, as well as scenic beauty and cultural heritage (Chiesura, 2004).

According to Trzyna (2014), urban PA's may have distinguished functions in relation to those placed in more remote areas, for example, they offer more opportunities tolearn about nature and sustainability, contribute to green infrastructure in the cities and they are able to raise awareness on nature conservation where more than 70% of people in Americas, Europe and Oceania live now. It is expected that good experiences in these areas may contribute to adherence of a growing urban population to the protection of the whole PA system, by "building a culture of conservation among citizens" (Wright and Matthews, 2015).

The many benefits of PA's, including the urban ones, were highlighted during the 2014 World Park Congress, when well-being was attributed to green areas and made this one of its main themes for discussion and improvement through the coming decade, emphasizing the need of making more explicit the cultural and natural services related to nature and PA's.

In the metropolitan region of Rio de Janeiro, where 12 million of people live in 19 municipalities, PA's represent ca. 16% of the territory (Scarano, 2014). They are strongly embedded in the minds of the population and used in daily activities, although most people are probably unaware of the formal recognition of these areas as parks or other PA category. In 2012, one of these PA's, Tijuca National Park, was declared a World Heritage Site by UNESCO's committee (Trzyna, 2014).

These PA's have also great biodiversity value – they protect important fragments of the highly threatened Atlantic Forest biome, one of the five biodiversity hotspots of the world (Myers et al., 2000). They host endemic and threatened species, as four mammals included in IUCN's global Red list and 11 in the regional list (Scarano, 2014) and are receiving species reintroduction initiatives (Cid et al., 2014). The magnificent scenario besides cultural, recreation and sport opportunities related to these areas are important factors in the choice of Rio de Janeiro as the host of world class events – Pan American Games (2007), Rio +20 (2012), World Cup (2014) that culminates with 2016 Olympic Games (Scarano, 2014).

In this context, the Pedra Branca State Park, the largest urban park in Brazil, occupying part of 17 neighborhoods and 10% of the total municipal area assumes a great conservation and social importance. On the other hand, due to the same complex context, the park faces a large array of pressures derived from to a disorderly and rapid urbanization as documented for other urban PA's (see Trzyna, 2014). Some activities that are in conflict with management expectations persist for a long time within the park, like housing, small agricultural practices, mining, and the use of clandestine water catchments (Guimarães and Pelin, 2015), some of them difficult to address. As a consequence of the complex context, conflicting visions emerge from different groups, such as park managers, visitors and local residents, adding many challenges for management decision related to rights over land, public use and natural exploitation, for instance (Palomo et al., 2011).

The understanding and valuation of perceptions and needs of the different stakeholders is an inescapable means of reaching culturally acceptable solutions that are longer lasting and effective (Gonçalves and Hoeffel, 2012), yet preventing the societal sense of cognitive isolation of protected areas (Stoll-Kleemann, 2001). In order to qualify management decisions is recommended that park managers, especially those who work in complex areas must be aware of emotions, values and attitudes that shape an individual's perceptions (Guimarães and Pelin, 2015) and the associated collective.

In the context of territorial planning and management, needs, knowledge and expectations of people can be revealed by a participative approach to promote their incorporation into the decision-making processes (Rambaldi et al., 2006), by many techniques (ex. Malleret-King et al., 2006). Public Participatory Geographic Information Systems (PPGIS) is being used to investigate the benefits of urban parks (Brown et al., 2014), national park management plan (see Palomo et al., 2011) and landscape values and ecosystem services (ES) through individual perceptions and preferences (Brown et al., 2011). This method also aids in the appreciation of the immaterial benefits related to cultural ES. For example, Raymond (2009) quantified and mapped the spatial distribution of natural capital and 31 ecosystem services (as listed by Millennium Ecosystem Evaluation) in Murray-Darling Bay, Australia, based on people's perceptions. PPGIS were also applied to the establishment of natural corridors, identification of socioecological hotspots, and the evaluation of potential benefits of urban green areas (as investigated by Brown et al., 2014).

In this study, the immaterial benefits associated with seven cultural ES in the Pedra Branca State Park were evaluated using the PPGIS approach. More specifically, it was analyzed the differences in perception between users groups, the correlation between ES services as well as the degree of spatial overlap between areas where people perceive cultural services and those areas proposed by the park management to be used and visited.

Materials and methods

Study area

Pedra Branca State Park (Fig. 1) encompasses 12,500 ha, all of which are above 100 m, and harbors the highest peak in the city of Rio de Janeiro, also named Pedra Branca, at 1.024 m.a.s.l. The park is an important fragment of Atlantic Forest, from which remains only 12% of the original cover. Due to its conformation, it plays important roles in climate regulation and ecosystem function in the region (INEA, 2013). Located in a region under a rapid urbanization process (INEA, 2013), it harbors beautiful views, waterfalls, rivers, dams and forest trails, offering opportunities for recreation and (eco)tourism (Guimarães and Pelin, 2015) – ca. 36.000 visitors are registered per year (INEA, 2013).

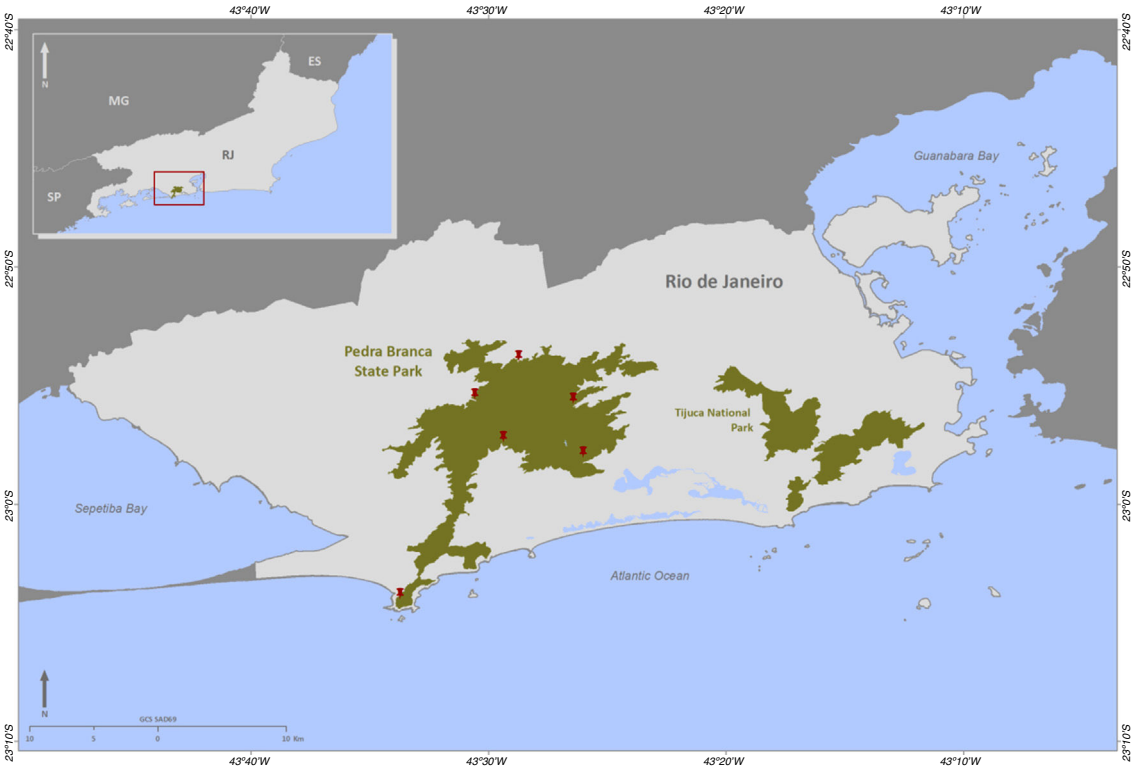

Fig. 1 – The location of Pedra Branca State Park in the city of Rio de Janeiro. Red marks indicate places were interviews were conducted.

The park was established on already occupied rural area, related to colonial times, and has around 4000 people living in few areas that concentrate residents reflecting difficulty to solve land problems (Guimarães and Pelin, 2015). Contiguous with the park are five other protected areas and sightseeing spots, but there is a predominance of disorganized urban expansion mixed with small rural properties and industries.

Survey of perceived cultural services

From the ten cultural service categories of the Millennium Ecosystem Assessment (MEA, 2005), seven were identified as most relevant to the present investigation: aesthetic values, social relations, recreation & ecotourism, knowledge systems & educational values, cultural heritage, cultural diversity, spiritual & religious values. Sense of place and inspiration were excluded since they seemed too complex to measure with the proposed methodology. Knowledge systems and educational values were combined into one category because they are very similar and difficult to differentiate given the assessment approach being used.

For the survey and the mapping of perceived services, 68 interviews were conducted, considering either residents, visitors or park staff – these are the three focus groups identified in the park management plan. Participants of the interviews have been chosen according to their predisposition to collaborate and based on their aleatory presence in six different places: Pau da Fome (eastern face); Piraquara (northern face); Camorim (southwestern face); Vargem Grande (southern face); Rio da Prata (western face), and the access to the park from Barra de Guaratiba (a beach to the South; Fig. 1).

Interviews were made in 13 days, during weekends and holidays, between December 2012 and July 2013, by the same interviewer. The questionnaire was composed of two parts and it took 15 min to fill out, usually. First, oriented by specific questions aiming the communication of what cultural ES are (Table 1), interviewees were required to map, according to their perception, the occurrence of each of the selected cultural services in the study area. Second, the interviewees answered general questions about frequency of visitation, average time spent in each visit, sex, age, education, place of residence and average income. Impressions about the nature of the park and about its relationship with the area were also collected.

We used the methodology of previous studies on PPGIS (Rambaldi et al., 2006; Raymond, 2009; Brown et al., 2011) with small adaptations, mainly to aid mapping. Three maps of A1 size and at the scale of 1:15,000 were provided on magnetized boards, each one corresponding to a region of the park, together completely covering the park. Respondents could choose which map to use and were provided with five magnets for each service, differentiated by colors. Respondents could freely use the magnets to identify places where they felt/thought services were provided.

Data analysis

The analysis of identified cultural services considered: (1) spatial mapping of each service in a 400 m × 400 m grid,

Table 1 – Cultural services mapped in Pedra Branca State Park: definitions (concept) and orienting question.

Cultural service	Concept	Orienting question
Aesthetic values	Many people find beauty or aesthetic values in many aspects of ecosystems.	In your opinion, where are the most beautiful areas of the park?
Recreation & ecotourism	People often choose where to spend their leisure time based in part on the characteristics of the natural or cultivated landscapes in a particular area.	Do you use any area in the park for sports?
Social relations	Ecosystems influence the types of social relations that are established in particular cultures.	Do you interact with friends or family members socially in the park? Where?
Knowledge systems & educational values	Ecosystems and their components provide the basis for both formal and informal education in many societies.	Is there any place in the park where you learn about the environment?
Spiritual & religious values	Many religions attach spiritual and religious values to ecosystems or their components.	Is there any place with spiritual values for you?
Cultural heritage values	Many societies place high value on the maintenance of either historically important landscapes or culturally significant species.	Do you recognize any place in the park as culturally significant?
Cultural diversity	The diversity of ecosystems is one factor that influences the diversity of cultures.	In the park, do you recognize any place for cultural events such as art or music?

Source: Own elaboration based on Millennium Ecosystems Assessment (MEA, 2005).

based on numbers of points marked per cell. Total number of points was normalized by the formula: $z = (x - \text{minimum value})/(\text{maximum value} - \text{minimum value})$, create a scale from 0.2 to 1 (minimum and maximum value per cell); (2) correlation among the identified cultural services using Pearson's algorithm; (3) frequency of each service per focus group; and (4) qualitative analysis of responses in relation to the park. These responses derived from open questions and were classified a posteriori among five categories: (1) sense of satisfaction of interests and needs; (2) sense of happiness and sense of care with the place; (3) sense of place/sense of belonging; (4) sense of identity; and (5) sense of dependency. All spatial analysis were made using the software ArcGis 9.3.

Results

Profiles

Of the 68 respondents, 79% were men and 21% women, with a median age of 35 years old (ranging from 14 to 78 years old). Forty-percent of all the respondents had finished high school and just 4% did not finish middle school. About half of the participants (52%) receive up to three Brazilian minimum salaries or wages (ratio reais/dollar ca. 2.24 at the time), with values ranging from zero to 8.000 reais. Thirty-four percent of the visitors visit the area less than once a month, and 19% began going to the park in the 2 to 5 years prior to the assessment. Reasonable knowledge about the park was declared by 35% of the respondents, whereas only 13% declared an excellent knowledge. Forty-three percent declared a reasonable knowledge of nature in the park, whereas among residents 54% felt that they have good or excellent knowledge and 9% have little knowledge of nature.

Frequency of cultural services by focus group

The respondents (11 from staff, 22 from residents and 35 from visitors) used 875 points to map their perceptions of the surveyed cultural services (199, 300 and 376 points, respectively). Aesthetic values were the most frequently marked service category with 256 points (55 from staff, 76 from residents and 125 from visitors). Recreation & ecotourism was the second most recognized with 159 points (staff: 41; residents: 47; visitors: 71) and social relations was the third with 143 points, followed by knowledge systems with 122 points. Cultural diversity, cultural heritage values and religious and spiritual values had 81, 78 and 36 points, respectively.

Spatial distribution of cultural ecosystem services

Cultural services were identified in almost all areas of the park, with a higher concentration of points in parts of the north-central, east and south regions. These regions corresponded to areas near the park headquarters, the Camorim dam and the natural beaches (Fig. 2).

Correlations in the perception of cultural services

There is a strong correlation between the areas of scenic beauty and those used for recreation ($r = 0.85$) and social relations ($r = 0.77$). Furthermore, the areas used for recreation and social relations are strongly correlated with each other ($r = 0.78$). Areas perceived as appropriate for cultural events show a moderate relationship with those perceived to have religious and spiritual value ($r = 0.65$, Table 2).

Relationship between respondents and the park

Discourse analysis showed that attachment to the park differs among focus groups and among their members. Among

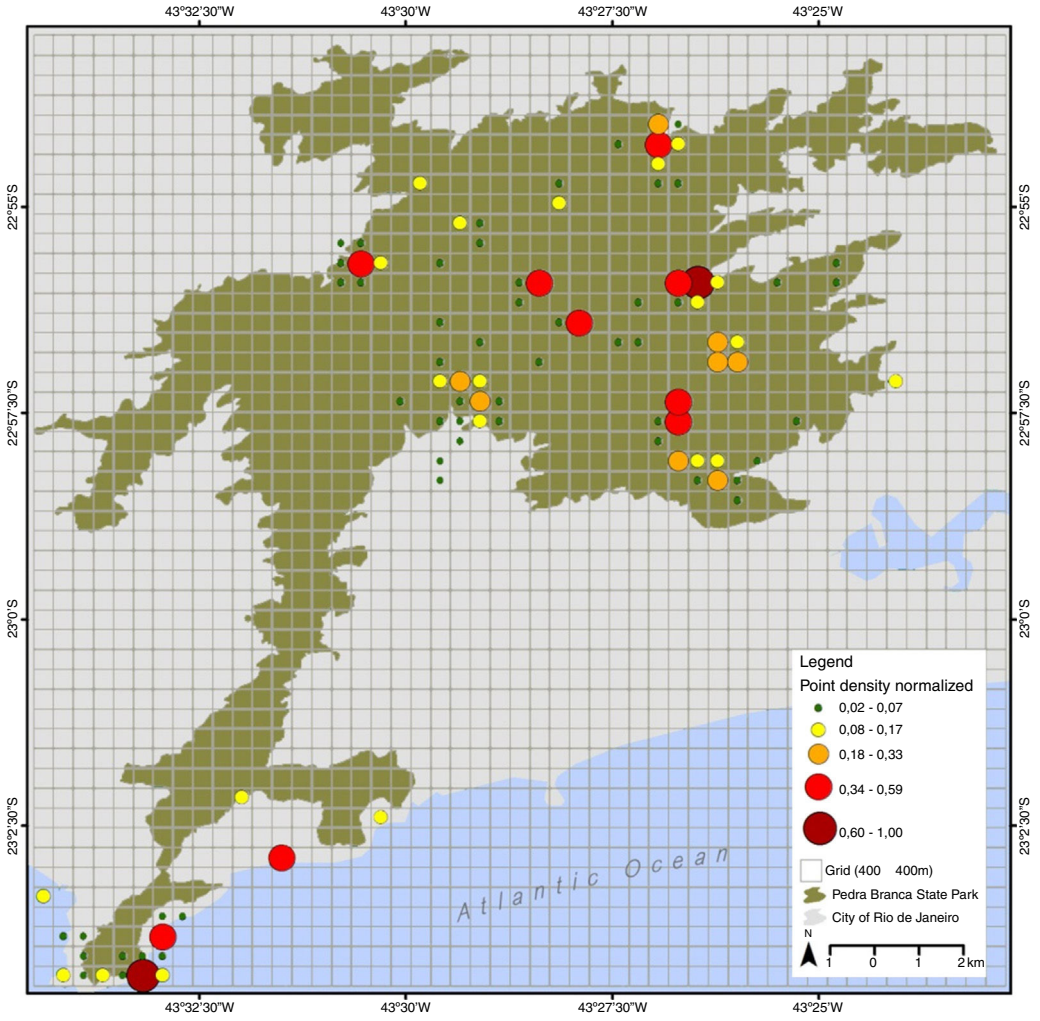

Fig. 2 – Density of points for all cultural ecosystems services identified mapped on a 400 m × 400 m grid and normalized by the maximum and minimum method.

tourists, 35% based their relationship on interests by nature and feelings of pleasure. Within this group, 12% described a sense of care with the park, 3% reported a strong sense of belonging and 1% declared an identity with the region. In the residents group, 16% had a strong sense of belonging and 7% had a sense of identity, presumably because most residents interviewed were born and raised in the park. Furthermore, 6% of residents reported having a sense of care related to the park and 3% declared their dependence to the park. In the staff group, 12% had a sense of identity related to the park, 3% had sense of care with the park and 1% declared having their needs and interests satisfied.

Table 2 – Spatial correlation (*r*) between cultural services mapped in Pedra Branca State Park.

	AE	CD	CH	RE	SR	REL	KS
AE	1	–	–	–	–	–	–
CD	0.658[a]	1	–	–	–	–	–
HC	0,103[NS]	0,029[NS]	1	–	–	–	–
RE	0.852[a]	0.609[a]	0.139[a]	1	–	–	–
SR	0.778[a]	0.546[a]	0.226[a]	0.786[a]	1	–	–
REL	0.519[a]	0.653[a]	0.117[a]	0.506[a]	0.449[a]	1	–
KS	0.580[a]	0.491[a]	0.151[a]	0.560[a]	0.546[a]	0.351[a]	1
Total points	256	81	78	159	143	36	122

Legend: AE, aesthetic values; CD, cultural diversity; CH, cultural heritage; RE, recreation & ecotourism; SR, social relations; REL, religious & spiritual values; SK, knowledge systems.

[a] $p < 0.0001$.

Discussion

Studies helping our understanding about the kind of activities or experiences that can best connect people to nature and increase conservation efforts to support PA's management are still rare (Wright and Matthews, 2015), besides a growing demand for this kind of knowledge, as registered in the 2014 World Park Congress. Among 12 innovative approaches presented in the Congress aiming bold changes in conservation results were: "improving health and well-being", "enhancing the diversity and quality of governance" and "inspiring a new generation".

Studies using people's perception about the benefits of protected areas may help to base and inspire new efforts to fulfill this lack of knowledge. For instance, Palomo et al. (2011) explored the socioecological aspects and benefits of ecosystems services in Doñana National Park plan, in Spain and Brown et al. (2016) used the social values and people's preferences for marine protected areas planning in Kimberly region, Australia. It is also possible to monitor the perceptions over time in order to check the alignment between how people experience the benefits of protected areas and how managers decide the public use in these areas.

In the case of Pedra Branca State Park the attractions already officially identified by park management are, in general, near to, or are at the same place as the areas perceived by the respondents to have scenic beauty and opportunities for social interaction and learning. This is in part related to the fact that the park's management plan formalizes previous uses, like some trails (INEA, 2013), but in parallel it seems that the implementation of the plan has an inductive role on public perception about what is to be seen and perceived. In this direction it is important to note that some park residents know of many historical and natural attractions that have not been identified or mapped in the park's management plan; for example, many charcoal plants used during colonial period are well known by the residents only. So, there are cultural and historical aspects perceived by residents in specific areas that are not visited by or presented to visitors, what may constitute a limitation to their experience in the park. Park managers could enrich the inventory of attractions in the Park by accessing also the vast knowledge of locals, adding sociocultural value to the park's natural areas and improving public use strategies. This is commonly done in regions with recognized high cultural heritage, like protected areas along the Andean mountains (ex. see Granizo et al., 2006) but is a rare approach in Brazil.

In Pedra Branca State Park, scenic beauty, recreation, and social interaction were the cultural benefits most frequently mapped by respondents and they were the most correlated, similar to what was found by Brown et al. (2011) during their research identifying ecosystem services in Grand County, Colorado. Possibly, this relationship comes from the fact that scenic beauty is commonly associated to preserved ecosystems and their natural processes, and together they motivate ecotourism, outdoor sports, and social interaction (MEA, 2005). This result should be highlighted since recent studies have demonstrated that outdoors recreation can incentive environmental friendly attitudes, and emotions felt throughout nature experience by visitors are important drivers of ecofriendly behavior (Wright and Matthews, 2015).

There is an understanding that people perceive cultural services differently according to their origins, as shown by Plieninger et al. (2013). Groups of people with different backgrounds with regards to culture, occupation, age, gender, socioeconomic status, among others, reveal different perceptions in relation to a same place (Gonçalves and Hoeffel, 2012). In the case of Pedra Branca State Park, while tourists – from teenagers to elderly people – most often reported feelings of pleasure and care for the park, the residents, most adults with low formal education, reported feelings of belonging and identity. Interviewees from the park staff, who were around 25s, with high formal education and working there for 6 months or less, also reported feelings of identity and have shown a strong sense of responsibility for park's nature protection. Attention to these characteristics is essential for park management according to a recent empirical research in Alberta, Canada, which has shown positive relationship between age, frequency of visit and the perception of how much people are connected to nature (Lemieux et al., 2015).

Respondents also perceived religious and spiritual benefits of the park. Part of this perception is likely related to sites in the park related to practices of the Catholic and evangelic creeds, including structures like chapels and oratories. Other places with natural beauty have been associated with religious and spiritual feelings, although without a clear religious reference. In general, Pedra Branca State Park is highly sought after by people who seek to express their religiosity (INEA, 2013) due to its many natural attractions, especially forests and waterfalls, combined with the tranquility in an urban context. Studies have shown that these meaningful experiences that people live while in nature lead to an increase in the sense of nature connectedness (Wright and Matthews, 2015).

For an urban area, the 36,000 visitors per year registered for Pedra Branca State Park is considered low although clearly underestimated, since there is a lack of control on the park's main entrances. In comparison, Tijuca National Park, also in Rio de Janeiro city, has the Brazilian PA record of visitation – 3.1 million visitors per year, but in reality most of them visiting the 'Christ the redeemer' statue. Brasilia National Park, in Brazilian capital, receives 229,000 and Serra dos Órgãos National Park, in Rio de Janeiro metropolitan region, receives 217,800 visitors, considering official numbers (ICMBio, 2015). These two parks have natural pools that attract families and large groups, often not conscious that they are in a Park. On the other side, swimming in many rivers and dams of Pedra Branca State Park is forbidden, since they contribute to water supply for the neighborhoods, resulting in some frustration and clandestine use (INEA, 2013).

According to the management plan (INEA, 2013) most visitors have low income and live nearby the Park (77%) and most go to the Park for walking along the trails or short visits. There is a recommendation of better communication in order to attract visitors from other regions of the city or even of the country. Considering the importance of frequency, quality of the visit and time spent in the protected area for the process of building a consciousness toward the site besides more ecofriendly behaviors (Wright and Matthews, 2015), managers

of Pedra Branca State Park should develop new interpretative programs combining lively outdoors experiences with educational initiatives focused on enhancing the level of information and knowledge as suggested by Guimarães and Pelin (2015) and Wright and Matthews (2015). There should be an investment in strategies toward increasing the awareness in relation to the cultural richness and benefits of the area as well as programs and incentives for longer stays in the park, such as long trails for hiking. For example, Pedra Branca massif could be more clearly and strongly related to the rich natural and cultural heritage of Rio de Janeiro Metropolitan region, by recovering and telling stories about previous occupations, its role in regional economic, social and cultural development (including old processes like the slavery trade), its actual role in ecological processes and in mitigating climatic harzards. A good opportunity can be the current implementation of a large trail crossing most protected areas of the city, the "Transcarioca trail", potentially connecting Pedra Branca - both mentally and physically - to other more visited and known sites.

Finally, Pedra Branca State Park represents a great opportunity for better connecting the urban population of Rio de Janeiro with the extremely vulnerable Atlantic Forest, in a portion of the metropolitan region where the lack of recreational opportunities prevails, but the management proposals must reinforce their focus on people. In doing so, the implementation of the park will be able to contribute with solutions to urban actual conflicts, including those directly related to nature conservation, and to mitigate the effects of climate change by the own increase/maintenance of forest cover and connectivity (Scarano, 2014) in Rio de Janeiro and associated area of urban/industrial expansion.

Conflicts of interest

The authors declare no conflicts of interest.

Acknowledgments

We would like to thanks the Pedra Branca State Park managers for their cooperation in the data collection of this study. We also thank Fabio Scarano and Bruno Coutinho for comments that greatly improved the manuscript.

REFERENCES

Bratman, G.N., Daily, G.C., Levy, B.J., et al., 2015. The benefits of nature experience: improved affect and cognition. Landsc. Urban Plan. 138, 41–51.

Brown, G., Montag, J.M., Lyon, K., 2011. Public participation GIS: a method for identifying ecosystem services. Soc. Nat. Resour. 25, 633–651.

Brown, G., Schebella, M.F., Weber, D., 2014. Using participatory GIS to measure physical activity and urban park benefits. Landsc. Urban Plan. 121, 34–44.

Brown, G., Strickland-Munro, J., Kobryn, H., et al., 2016. Stakeholder analysis for marine conservation planning using public participation GIS. Appl. Geogr. 67, 77–93.

Chiesura, A., 2004. The role of urban parks for the sustainable city. Landsc. Urban Plan. 68, 129–138.

Cid, B., Figueira, L., Mello, A.F.T., et al., 2014. Short-term success in the reintroduction of the red-humped agouti *Dasyprocta leporina*, an important seed disperser, in a Brazilian Atlantic Forest reserve. Trop. Conserv. Sci. 7, 796–810, Available online: www.tropicalconservationscience.org.

Fadini, A.A.B., 2005. Sustentabilidade e Identidade Local: Pauta para um Planejamento Ambiental Participativo em Sub-bacias Hidrográficas da Região Bragantina. Tese de Doutorado. UNESP, Rio Claro.

Godbey, G.C., Graefe, A., James, S.W., 1992. The benefits of local recreation and park services: a nationwide study of the perceptions of the American public. National Recreation and Park Association, Ashburn, VA.

Gonçalves, N.M., Hoeffel, J.L.M., 2012. Percepção ambiental sobre unidades de conservação: os conflitos em torno do Parque Estadual de Itapetinga – SP. Visões Transdisciplinares sobre Ambiente e Sociedade, Revista VITAS, n. 3, jun.

Granizo, T., Molina, M.E., Secaira, E., et al., 2006. Manual de Planificación para la Conservación de Áreas, PCA. TNC y USAID, Quito.

Guimarães, E., Pellin, A., 2015. BiodiverCidade: desafios e oportunidades na gestão de áreas protegidas urbanas. Matrix Editora, São Paulo, 200 p.

IBGE (Instituto Brasileiro de Geografia e Estatística), 2010. Censo Demográfico.

ICMBio (Instituto Chico Mendes de Conservação da Biodiversidade), 2015. Relatório de Gestão 2015. ICMBio, Brasília.

INEA (Instituto Estadual do Ambiente), 2013. Plano de Manejo–Parque Estadual da Pedra Branca. INEA, Rio de Janeiro.

Lemieux, C.J., Doherty, S.T., Eagles, P.F.J., et al., 2015. Healthy Outside-Healthy Inside: the human health and well-being benefits of Alberta's protected areas – towards a benefits-based management agenda. Canadian Council on Ecological Areas (CCEA) Occasional Paper No. 20. CCEA Secretariat, Ottawa, Ontario, Canada, vi + 71 pp.

Malleret-King, D., Glass, A., Wanyony, I., et al., 2006. Socio-Economic Monitoring Guidelines for Coastal Managers of the Western Indian Ocean, SocMon WIO (Version 1). CORDIO East Africa publication, pp. 108.

Maas, J., Verheij, R.A., Groenewegen, P.P., et al., 2006. Evidence based public health policy and practice: green space, urbanity, and health: how strong is the relation? J. Epidemiol. Commun. 60, 587–592.

Millenium Ecosystem Assessment, 2005. Ecosystems and Human Well-Being: Synthesis. Island Press, Washington, DC.

Myers, N., Mittermeier, R.A., Mittermeier, C.G., et al., 2000. Biodiversity hotspots for conservation priorities. Nature 403, 853–858.

Palomo, I., Martín-López, B., López-Santiago, C., et al., 2011. Participatory scenario planning for protected areas management under the ecosystem services framework: the doñana social-ecological system in southwestern spain. Ecol. Soc. 16, 23.

Plieninger, T., Dijks, S., Oteros-Rozas, E., et al., 2013. Assessing, mapping, and quantifying cultural ecosystem services at community level. Land Use Policy 33, 118–129.

Rambaldi, G., Kwaku Kyem, P.A., McCall, M., et al., 2006. Manejo y comunicación de la información territorial en forma participativa en los países en vía de desarrollo. Eletron. J. Inf. Syst. Dev. Ctries 11, 1–11.

Raymond, C.M., 2009. Mapping community values for natural capital and ecosystem services. Ecol. Econ. 68, 1301–1315.

Scarano, F., 2014. Rio de Janeiro: the metropolis and the Atlantic Forest. In: The Atlantic Forest: History that looks to the future. Edições de Janeiro, Conservação Internacional, Rio de Janeiro, pp. 182–223.

Stoll-Kleemann, S., 2001. Opposition to the designation of protected areas in Germany. J. Environ. Plan. Manage. 44, 109–128.

Trzyna, T., 2014. Urban Protected Areas: Profiles and best practice guidelines. Best Practice Protected Area Guidelines Series No. 22. IUCN, Gland, Switzerland, pp. 110, xiv+.

United Nations, Department of Economic and Social Affairs, Population Division (2015). World Urbanization Prospects: The 2014 Revision (ST/ESA/SER.A/366).

Wright, P.A., Matthews, C., 2015. Building a culture of conservation: research findings and research priorities on connecting people to nature in parks. Parks J. 21, 11–24.