DOI: 10.26717/BJSTR.2017.01.000251

G Liliana Bravo Monroy. Biomed J Sci & Tech Res

ISSN: 2574-1241

Short Communication Open Access

Ecological and Cultural Values of Water Bodies: Recognising a Plural-Values Approach of Ecosystems

G Liliana Bravo Monroy*

Alumnus of Centre for Agri-Environmental Research, Reading University, UK

Received: July 31, 2017; **Published:** August 03, 2017

***Corresponding author:** G Liliana Bravo Monroy, Alumnus of Centre for Agri-Environmental Research, School of Agriculture, Policy and Development, Reading University, UK

Introduction

This article explores cultural and ecological values associated with water bodies, which can be considered helpful tools for both sustainable management and strengthening of responsibilities of the general public towards water bodies. The paper begins by setting out a bioindicator assessment for the quality of streams. That is then extended with cultural values of water quality. The article ends by discussing conclusions in relation to the importance of integrating socio-cultural perspectives into decision-making and water management.

Methods

Bioindicator assessment for the quality of streams by using a macro invertebrate community index

The field study was conducted in 2005 in ten sites located in Chíquiza (Boyacá high mountain region, colombia). Indicators of stream quality were estimated according to the Biological Monitoring Working Party for Colombia - BMWP/Col (Roldán 2003). BMWP is a score system aimed at providing an index of river water quality based on aquatic macro invertebrates. Sampling is qualitative with a general assessment of the taxa of aquatic insects present, with observations of their relative abundance. Score is derived from points attributed to different invertebrate families, according to their degree of intolerance against organic pollution. If the aquatic community is made up of more intolerant species and a few intermediate and tolerant forms, the stream can be considered healthy. Poor water quality is indicated when the number of tolerant species exceeds that of intermediate species, and intolerant species are absent.

Ten sites were sampled along the Cane-Iguaque river sub-basin in three lagoons, two superficial aquifers and five streams of different sizes. Sites were selected according to: the symbolic significance of water bodies for local communities; water supply for household purposes; variety of land uses in catchments (i.e., crops such as potato, Andean tubercles, maize; livestock); stream size of 1st, 2nd and 3rd orders being headwater streams and first-order streams the smallest. Macro invertebrate were collected at each site by means of a hand screen or kicknet and the collected individuals were preserved in 70% ethanol. Identification was made in the lab to the family taxonomic level. Physical and chemical parameters were also quantified from samples of the same ten sites (e.g. inter alia, water conductivity, dissolved oxygen).

Cultural indicators of water quality

In order to extend the BMWP/Col score with measures of cultural health stream, interviews with fourteen members of potato farmers were carried out asking them to describe characteristics of a healthy waterway. Informal dialogues and observations in the fields were also carried out with farmers. From dialogues, observations and interview transcripts, indicators were derived for determining whether a river is healthy.

Results

Bioindicator assessment for the quality of streams by using a macro invertebrate community index

Sites with the highest water quality were found at San Pedro lagoon and Yerbabuena, El Molino, and Río Abajo streams. Examination of all samples resulted in a total number of 29 macro invertebrate families. The total number of identified families varied between two and 13 among particular sites. The maximum number of families (>10) was usually observed within a reserve area i.e., San Pedro lagoon (12); in areas with few settlements i.e., Río Abajo (13) and Yerbabuena (11) streams; and a local historic site i.e., El Molino (10) stream. At those locations the greatest total taxa number and the presence of the more sensitive ones to pollution were recorded e.g., taxa representing water-penny beetles Coleoptera (Psephenidae), beetles Coleoptera (Dytiscidae, Gyrinidae), mayflies Ephemeroptera (Leptophlebiidae), and also caddis flies Trichoptera

(Hydrobiosidae, Philopotamidae). In polluted areas those taxa disappeared or their numbers were significantly reduced. The most evident changes were recorded along the El Cerro and El Ensaye streams. The minimum number of families (<4) was accordingly found in those stretches i.e., El Cerro (2) and El Ensaye (4). At sites El Molino and Yerbabuena, results revealed high taxa diversity considering caddis flies (three families) and mayflies (two families). The highest taxa richness considering caddis flies was found at Río Abajo (four families). These insects were absent at El Ensaye site. At the remaining four sites caddis flies and mayflies were represented only by Hydroptilidae and Baetidae, while other particular families were found, inter alia, crabs (Pseudothelpudidae), backswimmers (Notonectidae) and dragonflies (Aeshnidae) [1].

Cultural indicators of water quality of high mountain regions

Five cultural indicators were derived from interviews and dialogues which highlight cultural, biotic and abiotic criteria [1]. A common view is that a site should be used as it had been used in the past. Indicators are grouped according to the following items:

i. Symbolic association with images of traditional significance for local communities. Water bodies are lived and experienced through associated images with the flow of the water i.e., intangible gilded figures ("Encantos") in the shape of anthropomorphic or domestic animals. Those intangible images have changed in accordance with water conditions through a period of more than fifty years: the presence and amount of those symbols have radically diminished with the progressive increase on pollution and the reduction of size on different stretches; water characteristics associated to those intangible images have also been altered e.g., former hardness ("Braveza") was weakened, which had an impact on previous stream health and the respect towards lagoons of high mountains.

ii. In-stream sensory characteristics. Tangible qualities comprise colour-clarity, sound, touch, taste and smell of water streams. In particular, it is common during droughts the occurrence of a thick red-yellow layer of ferrous sediment ("Caliche") at the bottom and surface of a stream. Furthermore, the source of a stream is settled by its sound according to the resonance of underground waters, which differ of superficial waters. Moreover, the warmth of a stream is touchable and is related to cleaner waters. A sweet taste and a clean smell are also useful categories of water quality. On the other side, riverbed condition is also a characteristic cited by farmers. That entails the occurrence of cobbles extending across the channel bottom -a favorable condition- as opposed to muds and sands.

iii. Land use on riparian margins and adjacent land. The use of riparian margin includes wild/natural vegetation, cultivated fields or grazed zones. Riparian vegetation consists of little/none, native or crop vegetation. The latter represents a way of concern given the use of agrochemicals. In contrast, native vegetation plays an important role in keeping healthy waterways (e.g., tree species such as Alnus jorullensis, Weimannia tomentosa, Prunus serotina, Salix humboldtiana). Livestock in close proximity to a catchment is indicative of water with lower quality. Riverbank condition is equally a useful category taking account of a stable against an eroding situation.

iv. Occurrence and abundance of animal species at a site. Species such as freshwater pseudothelphusids crabs are associated to healthy streams as well as exotic species as the common trout. In comparison, some specimens of flies, worms, beetles and frogs are associated to unhealthy streams.

v. Abundance and flow of water streams. Water volume, continuity of the flow from a source and visible movement across a river basin are all important aspects associated to healthy streams. It is worth noting that enough quantities of water, of a quality appropriate are important for the maintenance of healthy resources and their related cultural values.

Conclusion

This article has described cultural and ecological values of water quality. Cultural relationships arise from interactions between humans and other-than-human nature over time. Valuation schemes could be greatly supported by focusing not only on individual values but also on collective, shared and inter subjective meanings, significance and values [2-4] from water bodies; for instance, intangible (symbolic associations) and tangible values (in-stream sensory characteristics; land use on riparian margins and adjacent land; flow of water streams; abundance of animal species). While biological approaches offer information of water condition at a particular time, cultural relationships provide wider categories that help to better understand it in the broader temporal and spatial context. Including axiomatic, indivisible and incommensurable meanings [5] into water management plans is challenging and is facilitated through the application of a place-based approach [6]. Although the cultural indicators are specifically useful to assess local streams, it typifies a means of facilitating communication between resource managers and local communities. On the other side, contribution in this paper follows a key theme that has been highlighted by IPBES [7,8] as crucial in recognition of the plural nature of ecosystem values. Clearly, it is important that decision-making takes account of shared value approaches for enhancing participation, transforming environmental conflicts, integrating knowledge, and engaging policy makers and practitioners.

References

1. Bravo Monroy GL (2007) Iguaque: construcción social del territorio y manejo del agua. Master's thesis in Anthropology. Universidad de los Andes, Bogotá.

2. Cooper N, Brady E, Steen H, Bryce R (2016) Aesthetic and spiritual values of ecosystems: Recognising the ontological and axiological plurality of cultural ecosystem 'services'. Ecosystem Services 21: 218-229.

3. Kenter JO, Bryceb R, Christiec M, Cooperd N, Hockleye N, et al. (2016) Shared values and deliberative valuation: Future directions. Ecosystem Services 21: 358-371.

4. Schirpke U, Timmermann F, Tappeiner U, Tasser E (2016) Cultural ecosystem services of mountain regions: Modelling the aesthetic value. Ecological Indicators 69: 78-90.

5. Sanna S, Eja P (2017) Recreational cultural ecosystem services: How do people describe the value? Ecosystem Services 26: 1-9.

6. Jobstvogt N, Watson V, Kenter JO (2014) Looking below the surface: The cultural ecosystem service values of UK marine protected areas (MPAs). Ecosystem Services 10: 97-110.

7. IPBES (2016) Summary for policymakers of the assessment report of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services on pollinators, pollination and food production. Potts SG, Imperatriz Fonseca VL, Ngo HT, Biesmeijer JC, Breeze TD, et al. (eds) Secretariat of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, Bonn, Germany, p: 36.

8. Díaz S, Demissew S, Carabias J, Joly C, Lonsdale M, et al. (2015) The IPBES conceptual framework - connecting nature and people. Current opinion in Environmental Sustainability 14: 1-16.