

## **Good and beautiful? Associated changes in ecological quality and social perception of passively restored river reaches in Portugal and France**

Bon et beau ? Dynamique conjointe de la qualité écologique et de la perception esthétique de rivières suite à leur restauration passive au Portugal et en France

Rodríguez-González, P.M.<sup>1</sup>, Arsénio P.<sup>2</sup>, Bernez, I.<sup>3</sup>, Dias, F.S.<sup>4</sup>, Bugalho, M.N.<sup>4</sup>, Dufour, S.<sup>5</sup>

1Centro de Estudos Florestais, Instituto Superior de Agronomia, Universidade de Lisboa, Tapada da Ajuda, 1349-017, Lisboa, Portugal, patri@isa.ulisboa.pt

2LEAF- Linking Landscape, Environment, Agriculture and Food, Instituto Superior de Agronomia, Universidade de Lisboa, Tapada da Ajuda, 1349-017, Lisboa, Portugal, arseniop@isa.ulisboa.pt

3INRA, Agrocampus Ouest, UMR 985 ESE, Ecology & Ecosystem Health, 65 rue de Saint-Brieuc, CS 84215-35042 Rennes Cedex, France; Ivan.Bernez@agrocampus-ouest.fr

4Centro de Ecologia Aplicada 'Prof. Baeta Neves' – (CEABN-InBIO), Instituto Superior de Agronomia, Universidade de Lisboa, Tapada da Ajuda, 1349-017 Lisboa, Portugal; fsdias@isa.ulisboa.pt, migbugalho@isa.ulisboa.pt

5Université Rennes 2, CNRS UMR LETG, Place du Recteur Henri Le Moal, 35043 Rennes Cedex, France; simon.dufour@univ-rennes2.fr

### **RÉSUMÉ**

La dimension sociale est un élément crucial du succès des actions de gestion et de restauration des cours d'eau. L'objectif de cette étude est d'analyser conjointement le changement des conditions écologiques et de la perception de tronçons fluviaux faisant l'objet d'une action de restauration passive dans le contexte rural de l'Alentejo (Portugal). Des indicateurs écologiques obtenus à partir de relevés floristiques ou de la méthode SVAP ont été utilisés pour évaluer les conditions écologiques. Des indicateurs de perception esthétiques ont été collectés lors d'enquêtes basées sur le principe d'analyses sémantiques différentielles. Les résultats préliminaires montrent premièrement que les changements écologiques et perceptifs ne sont pas linéairement liés. Deuxièmement, des différents de perceptions apparaissent entre les groupes d'acteurs. De fait, une communication efficace ne doit pas se contenter de clarifier les objectifs des actions de restauration mais elle doit aussi favoriser l'intégration des différents regards qui sont portés sur les cours d'eau.

### **ABSTRACT**

Social dimension is a critical element of river management and ecological restoration success. This study aims to contrast changes in ecological condition and aesthetic perception in rivers managed under Passive Restoration approaches in the rural landscape of Alentejo (Portugal). Ecological indicators obtained from floristic relevés and from Stream Visual Assessment Protocol Index (SVAP) were used to assess riparian condition and ecological quality of the sites, respectively. Aesthetic perception indicators were collected in an inquiry form, developed following the principles of semantic differential analysis. The society response to the changes observed on riparian ecosystem as a result of passive restoration trajectory were analysed across different stakeholders (environmental sciences students, managers/landowners) in Portugal and France. Preliminary results indicate first that ecological condition changes are not linearly related to perception changes. Second, experience and cultural background seems to influence perception of ecological condition across different society groups. Effective communication encouraging the participation of actors is essential for clarifying aims of restoration and ensure stakeholder engagement throughout the different stages of the project.

### **KEYWORDS**

Aesthetic Perception, Forest Stewardship Council, Passive Ecological Restoration, Riparian Ecosystem, Stakeholder's Engagement

## 1 INTRODUCTION

Social understanding of ecological restoration activities can be an issue, especially when using Passive Restoration (PR) approaches. Two main issues are usually pointed out in this context: firstly, acknowledgment of ecological quality may not be obvious for stakeholders or the general public, secondly, attachment to places is mainly driven by aesthetic experience, rather than by the recognition of ecological quality. This is in line with Gobster *et al.* (2007) who state that aesthetically pleasing landscapes are more likely to be appreciated and protected than undistinguished or ugly landscapes, regardless of their less directly perceivable ecological value. Thus it is important to investigate how people perceive scenic quality in landscapes and if there is a relationship with its ecological quality. Consequently, the goal of this study was to assess people's perception of aesthetic and ecological indicators across two passive restoration trajectories in headwaters of Portugal.

## 2 MATERIALS AND METHODS

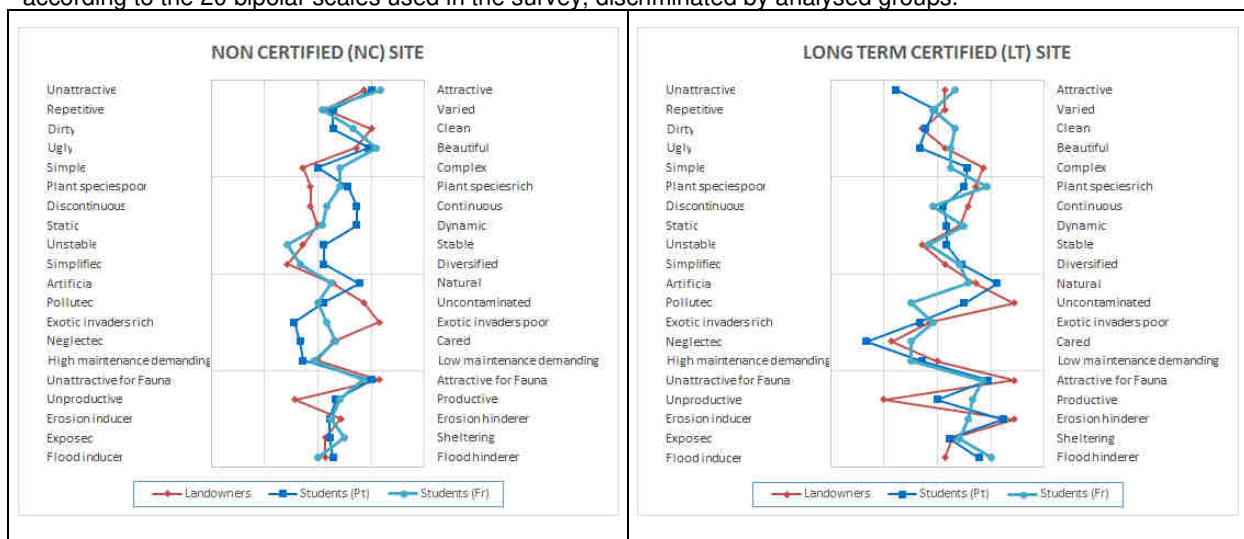
Study sites comprise 4 sites in 3 headwaters streams on the Tagus basin (AL, Alentejo, Portugal) subject to a scheme of passive restoration that encompass cattle exclusion (FSC-certification, see Dias *et al.* 2015) in cork-oak savannas. Sampling was carried out in 2016, encompassing one study site after 1 year (short term certified- ST) and one site 8 years (Long term certified - LT) after certification, one Non certified (NC) and 1 Reference site (REF), which represented least disturbed riparian condition. In each river reach we sampled vegetation and riparian condition by means of floristic relevés using plant species percentage cover (3-4 plots per site, total of 13 plots), and by applying Stream Visual Assessment Protocol-SVAP (see Dias *et al.* 2015 for details).

Perceived landscape quality and ecological quality was investigated through the development of a semantic differential survey, following the specifications of Verhagen, Van den Hooff & Meents (2015). A preliminary version of the survey form was developed, using 4 sets of photographs of Portuguese sites (NC, ST, LT, REF), each being characterized by 23 bipolar scales. After a first trial, done in order to ensure linguistic clarity and to avoid redundancy, 20 bipolar scales remained, grouped in 4 domains: 'Scenic quality', 'Ecological structure and function', 'Naturalness and management' and 'Functions and services for society'. A total of 39 inquiries were performed, 6 from portuguese stakeholders (landowners), 21 from portuguese landscape architecture students and 12 from french geography students (See Portuguese and French version of the survey forms in Supplementary Material).

## 3 RESULTS AND DISCUSSION

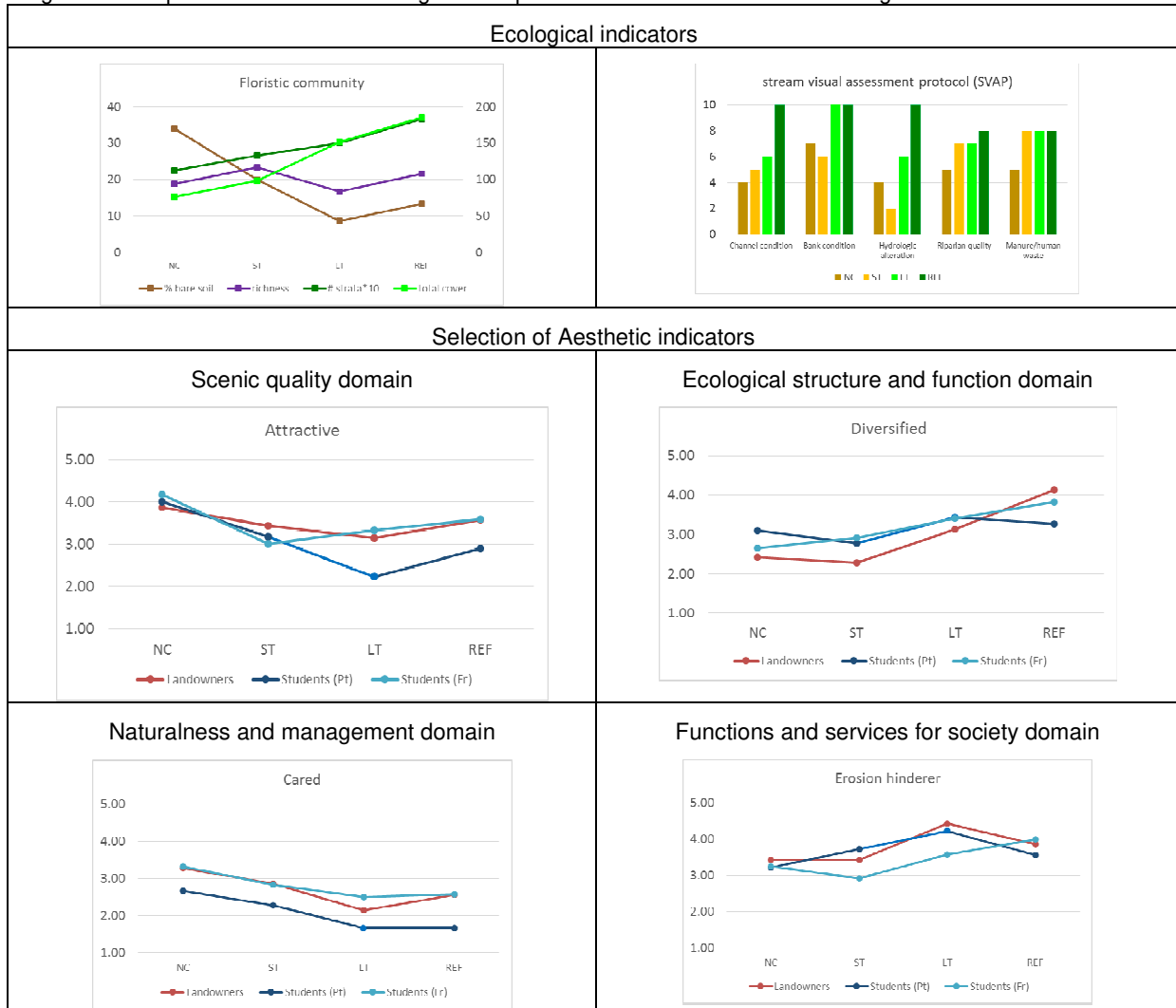
Semantic differential analysis showed that responses to perception inquiry varied among groups analysed and the four domains. Experience and cultural background seems to influence perception of ecological condition across different groups, with landowners being able to attribute differentiated scoring across the restoration process rather than the students group (Figure 1).

Figure 1. Representation of mean evaluation of two sites (left: non certified site; right: long term certified site) according to the 20 bipolar scales used in the survey, discriminated by analysed groups.



Ecological and aesthetic indicators compared among NC, ST, LT and REF sites by means of ANOVA revealed contrasting trends (Figure 2).

Figure 2. Comparison of selected ecological and perceived aesthetic indicators among sites



Floristic data and SVAP values generally indicated improvement of river ecological quality through passive restoration process (e.g. for plant cover:  $F_{3,9}=16.2922$ ,  $P=0.0005$  or number of strata:  $F_{3,9}=5.1969$ ,  $p=0.0234$ ). Perception responses did not always correspond to ecological change. In particular, ‘scenic quality’ and ‘Naturalness and management’ indicators displayed significant opposite trends (“attractive”,  $F_{3,136}=9.363$   $p=0.0000$ ; “cared”,  $F_{3,136}=9.739$ ,  $p=0.0000$ ), reflecting more negative perceptions with time since passive restoration. Conversely, indicators of perceived ecological structure and function were coherent with ecological indicators (“diversified”  $F_{3,136}=8.959$   $p=0.0000$ ; “erosion hinderer”  $F_{3,136}=5.254$   $p=0.0018$ ).

These results indicate that misalignments between ecological conditions and social consideration may lead to misunderstanding among managers, stakeholders or other societal groups. This highlights the need to assess ecological improvement following river restoration but also understanding how restoration is socially perceived in order to promote effective communication and engagement of stakeholders in the restoration process.

## LIST OF REFERENCES

- Dias, F.S., M.N. Bugalho, P.M. Rodríguez-González, A. Albuquerque, & J.O. Cerdeira (2015). Effects of forest certification on the ecological condition of Mediterranean streams. *J of Applied Ecology*, 52, 190-198
- Gobster, P., Nassauer J., Daniel T. & Fry G. (2007). The shared landscape: what does aesthetics have to do with ecology? *Landscape Ecology* 22(7), 959–972. doi:10.1007/s10980-007-9110-x.
- Verhagen, T., B. Hooff & S. Meents (2015). Toward a Better Use of the Semantic Differential in IS Research: An Integrative Framework of Suggested Action. *Journal of the Association for Information Systems* 16(2). Available at <http://aisel.aisnet.org/jais/vol16/iss2/1>.