



BOOK OF ABSTRACT

- I. SESSION DESCRIPTION
- II. SESSION PROGRAM
- III. ABSTRACTS

I. SESSION DESCRIPTION

ID: B2c

Recovery of ecosystem services in restored aquatic systems

Hosts:

	Title	Name	Organisation
Host:		Maria C. Uyarra	AZTI
Co-host(s):		Ángel Borja, Sarai Pouso	

Abstract:

Over the last decades, restoration projects have been implemented in aquatic environments in order to halt degradation and improve ecosystem functioning, structure and biodiversity. Several reviews have investigated the recovery of these environments from degradation. The assessment of restoration success is based on changes in specific aspects of the ecosystem (i.e. functioning, structure and/or biodiversity). Even if there is a general agreement on the ability of ecological restoration to improve biodiversity, achieve good ecological status, and increase the provision of ecosystem services, how ecosystem functions and processes connect to ecosystem services provisioning is still not well understood.

The linkages between environmental condition improvement, ecological improvement and increase in the provision of ecosystem services is a field to be further studied. This session encourages the submission of contributions that explore such linkages, especially those using multidisciplinary approaches (including ecological, economic and social aspects) that bring a more holistic vision of the topic.

Goals and objectives of the session:

- Define the state-of-the-art regarding the linkages between ecosystem and ecosystem services (ES) restoration in aquatic systems
- Identify barriers preventing the recovery of ES after restoration
- Moving forward towards the assessment of ES in restored systems



Planned output / Deliverables:

We will promote a special issue in a scientific journal and/or a position paper on the topic

Related to ESP Working Group/National Network:

[Biome Working Groups: B2c – Freshwater systems](#)

II. SESSION PROGRAM

Date of session: Thursday, 18 October 2018

Time of session: 16:30 – 18:00

Time	First name	Surname	Organization	Title of presentation
16:30–16:45	Daniela	Avila	Polytechnic University of Catalonia (UPC)	Natural water treatment systems and ecosystem services in watersheds of the Cauca Department, Colombia.
16:45–17:00	Sarai	Pouso	AZTI	Does recovery of ecosystems equal to the recovery of ecosystem services? Recreationalists' perceptions of the recovered Nerbioi estuary
17:00–17:15	Erik	Gomez-Baggethun	Norwegian University of Life Sciences (NMBU) and Norwegian Institute for Nature Research (NINA)	Changes in ecosystem services from wetland loss and restoration: An ecosystem assessment of the Danube Delta (1960–2010)
17:15–17:30	Sarai	Pouso	AZTI	The capacity of a restored estuary to provide ecosystem services: system dynamics modelling as a useful tool to simulate recreational fishing



Time	First name	Surname	Organization	Title of presentation
				benefits
17:30–17:45	Didac	Jorda–Capdevila	ICRA	Assessment of ecosystem services in intermittent rivers and ephemeral streams – a transdisciplinary dialogue
17:45–18:00	Chairs	Chairs		General discussion and questions on the topic

III. ABSTRACTS

The abstracts appear in alphabetic order based on the last name of the first author. The first author is the presenting author unless indicated otherwise.

1. Type of submission: **Abstract**

B. Biome Working Group sessions: B2c Recovery of ecosystem services in restored aquatic systems

Natural water treatment systems and ecosystem services in watersheds of the Cauca Department, Colombia

First author: Daniela Avila García

Affiliation, Country: Polytechnic University of Catalonia (UPC), Spain

Water is essential for life and important for the socio-economic development of the countries. However, the worldwide water quality and provision has been impacted by human activities at small and large spatial scale. New methods and technologies for its treatment and reuse have been proposed. The conservation, creation and restoration of wetlands and buffer strips are examples of natural treatment systems with a high potential for their integration into the landscape and the ecological functioning of rivers, which also contribute to improve the ecosystem services related to water availability and quality. In this research, we analyzed water-related ecosystem services based on the Toolkit for Ecosystem Service Site-based Assessment (TESSA) and tree protocols for the evaluation of the ecological quality of riparian vegetation: RQI (Riparian Quality Index), QBR (Qualitat del Bosc de Ribera) and CERA-S (Evaluation of the Ecological Status of Andean Rivers– Simplified) in four watersheds of the municipalities of the Cauca Department, Colombia (Popayán, Santander, Suárez and Timbío). We evaluated activities that could be impacting the quality and quantity of water in



each one of the watersheds. In addition, strategic zones were identified for the conservation, creation or implementation of wetlands and buffer strips based on the results of the indexes, water physicochemical parameters and the application of alternative scenarios using tools recommended by TESSA as Costing Nature, Agua Andes–WaterWorld (Policy Support System V.3) and GIS software. The results of this study demonstrate the application of TESSA and modeling tools to carry out rapid and low–cost assessments of ecosystem services in areas where information may be limited or with difficult access. They also contribute knowledge of the area to support political and management decision–making related to the use and management of water resources.

Keywords: Ecosystem services, TESSA, watershed management, buffer strips, wetlands.

2. *Type of submission: Abstract*

B. Biome Working Group sessions: B2c Recovery of ecosystem services in restored aquatic systems

Changes in ecosystem services from wetland loss and restoration: An ecosystem assessment of the Danube Delta (1960–2010)

First author: Erik Gomez–Baggethun

Affiliation, Country: Norwegian University of Life Sciences, Norway

Deltaic flood plains provide critically important ecosystem services for humans, including food production, fresh water, flood control, nutrient cycling and immaterial benefits such as spiritual values and opportunities for recreation. Despite growing recognition of their societal and ecological importance, deltaic flood plains are declining worldwide at alarming rates. Loss of wetland ecosystem services bears long–term socio–economic costs that tend to be overlooked in policy and planning, ultimately being shifted towards future generations. Conversely, research suggests that wetland restoration can deliver important long–term benefits. This paper examines the costs and benefits of wetland loss and restoration at the Danube Delta, one of Europe’s largest and most outstanding wetlands. First, we identify, characterize and measure the ecosystem services and benefits provided by the Danube Delta. Second, we assess trends in ecosystem services supply between 1960 and 2010, contrasting two periods characterized by different socio–political and economic frames: the socialist period where policies focused on land development (1960–1989) and the market–economy period where policies shifted towards ecological restoration and international trade(1990–2010). Our results indicate that i) the Danube Delta provide critically important



services which benefits accrue from local communities to humanity at large, ii) over 60% of the Delta's ecosystem services have declined over the studied period, iii) socio-economic benefits from ecological restoration policies are already becoming apparent, and iv) part of this improvement occurs at the expense of shifting environmental costs to other areas.

Keywords: ecosystem assessment, socio-environmental costs, wetlands, restoration, Danube Delta, Romania

3. *Type of submission: Abstract*

B. Biome Working Group sessions: [B2c Recovery of ecosystem services in restored aquatic systems](#)

Assessment of ecosystem services in intermittent rivers and ephemeral streams – a transdisciplinary dialogue

First author: Dídac Jorda-Capdevila

Affiliation, Country: Catalan Institute for Water Research (ICRA), Spain

In the light of the limited knowledge on intermittent rivers and ephemeral streams (IRES), compared to that on permanent running waters, the SMIRES Cost Action aims at joining researchers from multiple fields (from hydrologists to ecologists, economists and managers) to create and compile knowledge about IRES. One of the works arisen from SMIRES is a transdisciplinary dialogue for searching, selecting, developing and implementing indicators for the assessment of ecosystem services in IRES. The studies on ecosystem services in perennial rivers cannot be successfully extended to intermittent rivers and ephemeral streams because of functional and structural differences. For instance, biogeochemical processes when the riverbed is dry and when water flows diverge, as well as the associated flora and fauna. Still, the lack of water does not imply a loss of services, rather a different type. For instance, dry riverbeds do not provide surface water but notably regulate its infiltration to aquifers. They even have specific socio-cultural value when runners use them as path or when shepherds use them as corridors for the livestock, among others. Thus, our presentation aims at raising awareness of the ecosystem services provided by IRES and encouraging researchers and managers to consider them in their socioeconomic assessments. In particular, we will 1) briefly introduce the main characteristics of IRES and the ecosystem services they provide, 2) present how by means of a transdisciplinary dialogue we have developed and selected indicators of ecosystem services (e.g., a photo-series



analysis in dry and flooded riverbeds), and finally 3) present and discuss how the indicators have been applied in several case studies in Czech Republic, France, Greece, Italy and Spain.

Keywords: ES indicators, intermittent rivers, transdisciplinarity, SMIRES, European rivers.

4. *Type of submission: Abstract*

B. Biome Working Group sessions: B2c Recovery of ecosystem services in restored aquatic systems

The capacity of a restored estuary to provide ecosystem services: system dynamics modelling as a useful tool to simulate recreational fishing benefits

First author: Sarai Pouso

Affiliation, Country: AZTI, Spain

The social–ecological system framework is a useful approach to study marine ecosystem services such as recreational fishing, helping in the comprehension of human–nature interactions and of the outcomes of these interactions. System dynamic models (SDMs) are an integrated environmental modelling approach that can be used to model social–ecological systems. In this study, the recreational fishing activity in the restored Nerbioi estuary (Basque Country, Spain) was used to: (i) build a SDM representing the capacity of the estuary to provide ecosystem services and to measure the benefits (i.e. recreational fishing), and (ii) run simulations and analyze the consequences that future environmental management decisions and environmental accidents could have on the recreational fishing. The SDM built linked key ecological components (e.g. fish abundance and fish richness) with the social benefits obtained through recreational fishing (e.g. number of recreational fishers and their overall satisfaction with the activity), facilitating the comprehension of the complex relations and dependencies between the elements that shape this social–ecological system. The results of the simulations suggested that this system is currently resilient and able to respond to punctual and unexpected environmental changes. Also, that the adoption of environmental management measures to improve the sanitary and ecological conditions of the Nerbioi estuary could result in positive consequences for the recreational fishing activity. In conclusion, SDM can be a useful tool in environmental management alternative evaluation, as it facilitates the comprehension of the effects that the adoption of each alternative can have on both ecological and social variables, using scientifically reliable information. This tool can be especially useful when dealing with the non–material benefits such as cultural ecosystem services. Analysing the consequences that the adoption of environmental



management actions can have on ecosystem services is necessary to ensure the success of the actions upon their implementation, and also to secure the future equilibria of the social-ecological systems.

Keywords: social-ecological systems, recreational fishing, system dynamics modelling, ecosystem restoration

5. *Type of submission:* **Abstract**

[B. Biome Working Group sessions: B2c Recovery of ecosystem services in restored aquatic systems](#)

Does recovery of ecosystems equal to the recovery of ecosystem services? Recreationalists' perceptions of the recovered Nerbioi estuary

First author: Sarai Pouso

Affiliation, Country: AZTI, Spain

Well-functioning ecosystems hold high values of biodiversity and can provide a wide range of ecosystem services. In 25 years, Nerbioi estuary (North Spain) has changed from being one of the most polluted estuaries in Europe to one with a moderate ecological status, mainly due to the settlement of a Waste Water Treatment Plant in 1990. Recorded biotic and abiotic parameters show a clear ecological improvement in the estuary, but little is known about how these improvements influenced cultural ecosystem services and human well-being. In this study, we focused on two cultural services: recreational fishing along the estuary and bathing waters in three estuarine beaches. Two questionnaires were distributed to capture recreationalists behaviour and perceptions and compared with recorded environmental parameters. Most respondents perceived an improvement in water quality and linked it to the estuarine sanitation. Furthermore, results showed a positive correlation between the spatial pattern of the ecological recovery and users' behaviour: fishers preferred to fish in the outer estuary over the outer estuary; while beach visitors preferred to swim in the more external beaches over the inner one. However, not all the perceptions were in line with recorded improvements, with fishers' perceptions being more negative than recorded changes on fish abundance and fish richness. Despite this, both fishers and beach users are satisfied with the overall recreational experience and will probably continue visiting the estuary. Our findings highlight that water sanitation actions are important for the recovery of degraded coastal environments and for the maintenance of ecosystem services. Also, that multidisciplinary research is necessary to better comprehend the links between environmental recovery and the provision of ecosystem services.



Keywords: wastewater treatment, questionnaire, long-term monitoring, recreational services