BOOK OF ABSTRACTS

I. SESSION DESCRIPTION

ID: B3

Forest ecosystem services, water regulation & public policies in the face of global changes

Hosts:

	Title	Name	Organisation	E-mail
Host:	Dr.	Amelie Robert	University of Tours, UMR CITERES	amelie.robert@univ-tours.fr
	Dr.	Gregory Valatin	Forest Research	gregory.valatin@forestresearch.gov.uk

Abstract:

Forests are a source of provisioning services (wood and other forest products) but also provide a range of other ecosystem services (ES) from absorbing air pollution to creating spaces for spiritual nourishment, artistic and recreational activities (cultural services), and contributing to climate change mitigation through carbon sequestration, storage and substitution.

This session will focus specifically on links between forests and ES related to water regulation and protection. Forests have a major role to play in protecting the water environment, while tree planting offers a very effective way of improving water quality, alongside contributing to climate change mitigation and other policy goals. Improved understanding of interactions between trees and water is needed to underpin a greater role for planting to meet targets such as the EU's Water Framework Directive (WFD) objective of all water bodies achieving good ecological status by 2027. We will draw upon examples of forest benefits such as filtering farm run-off and improving water quality through interception of pollutants and sediment from agriculture, as well as slowing peak flows to reduce downstream flood risk. In addition to synergies, trade-offs can influence provision of the different forest ES, while if forests are not managed sustainably, trees not planted in the right place, or biotic or abiotic risks are realised, ecosystem disservices can arise.

The session aims to explore a number of related issues: In which way are these different ES, including trade-offs and synergies, taken into account in current public policies? Do policies focus on a single major ES or do they consider several services, reflecting the multifunctionality of forests? What is the balance between planting more forests, food security and protecting open habitats? How strongly should the impacts of climate change drive considerations in view of the climate emergency? How are trade-offs between different ES handled in practice on the ground and by different societal actors? What impacts of climate changes on the provision of ES are considered and how are these taken into account in public policies? Where climate change

mitigation is a main driver to plant more forests, what evidence on trade-offs is accounted for – including regarding introduction of new species considered more suitable to a future climate and associated biotic risks where planting stock has to be sourced from outside the country? To what extent are payments for ecosystem services (PES) a useful way to shape landowners' and forest managers' choices and how can schemes best be integrated within public policies?

PES are an example of incentives, which aim to rectify sub-optimal provision of ES – including many ES provided by forests, with a fundamental challenge for policy being to ensure schemes are designed in ways that ensure a socially optimal mix and provision of ES with minimal disbenefits. Meeting policy targets in a cost-effective way such as the EU's WFD 2027 objective and the UN 2030 Agenda for Sustainable Development Goals of ensuring sustainable management of water is expected to require spatially-targeted measures and mainstreaming incentive systems such PES. This session aims to explore ways in which this can be achieved allowing for climate change and other global challenges.

This session encourages presentations from interdisciplinary studies that provide a broad perspective on:

- interactions between woodlands, water quality improvement and the provision of other ecosystem services;
- analyze existing policies and the way they account for forest ES, their synergies and trade-offs and potential land use conflicts, especially in the context of climate change;
- the role incentive schemes can play in helping meet water-related targets, climate change mitigation and other policy goals.

We particularly encourage papers that contribute to an improved understanding of synergies, trade-offs and potential disbenefits in providing forest ecosystem services, as well as on design, effectiveness and cost-effectiveness of associated incentive schemes, and of approaches to facilitate their adoption and mainstreaming by policy makers while also taking account of climatic and other relevant global changes. We seek papers that challenge the boundaries of current thinking on the contributions that forest-related incentive schemes can make to meeting the challenges of water-climate change policy nexus.

This session is jointly promoted by the Payments for Ecosystem Services (Forests for water) COST Action (PESFOR-W), a scientific network seeking to improve our understanding of the environmental effectiveness of targeted woodland planting for improving water quality, and the cost-effectiveness and design of woodlands for water PES schemes to improve Europe's capacity to use forest-based PES to help achieve WFD targets.

Goals and objectives of the session:

- Explore how best to design incentive schemes to ensure a socially optimal provision of forest ecosystem services with minimal disbenefits allowing for global changes.
- Draw lessons from the available empirical evidence on the Environmental Effectiveness, Cost-Effectiveness and Design and Governance of existing incentive mechanisms to encourage water quality improvement, climate change mitigation and provision of other ecosystem services from woodlands and minimize disbenefits.
- Explore the policy, economic, environmental and institutional implications of these lessons for the future development of policy and incentive schemes.

- Disseminate findings of the PESFOR-W COST Action, including end user guidance on developing new woodlands for water PES schemes aimed principally at the provision of water-quality improvement related ecosystem services
- Coordinate the development of a new research and policy agenda on forests for water, climate change mitigation and the provision of other ecosystem services, bringing together science, policy and practical implementation perspectives, with a view to helping foster cross-cutting policy integration, triggering interest from investors and greater implementation of forest-related PES schemes on the ground.

Planned output / Deliverables:

A journal special issue may be considered.

Related to ESP Working Group/National Network:

Biome working group: BWG 3 – Forests & Woodlands

II. SESSION PROGRAM

Date of session: Wednesday, 9 June 2021
Time of session: 15:30 – 17:50

Timetable speakers

Time	First name	Surname	Organization	Title of presentation
15:30 15:35	Amélie Gregory	Robert Valatin	University of Tours, UMR CITERES Forest research	Introduction
15:35 15:50	Gregory	Valatin	Forest Research	Woodlands for water quality Payments for Ecosystem Services: findings of the PESFOR-W COST Action
15:50 16:05	Fernando	Gordillo	Thuenen Institute of International Forestry and Forest Economics	Additionality and leakage resulting from PES implementation? Evidence from the Ecuadorian Amazonia
16:05 16:20	Ashley	Hardaker	Bangor University	Optimisation of land use in the Welsh uplands for reconciling increased tree cover, ecosystem services and agricultural incomes
16:20 16:35	Michael	Segun Bolarinwa	International Union for Conservation of Nature	The Effect of Deforestation on Climate Change
16:35 16:50	Rositsa	Yaneva	Bulgarian Academy of Sciences	A DPSIR assessment on ecosystem services in Sredna Stara Planina Mountain, Bulgaria

Time	First name	Surname	Organization	Title of presentation
16:50 17:05	Bede	West	UK Centre for Ecology and Hydrology, and Bangor University	Make like a tree and leave: How will tree species loss and climate change alter future temperate broadleaved forests?
17:05 17:20	Armin	Deitenbach	Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH	Elaboration of nine Municipal Plans of the Atlantic Forest in Central Rio de Janeiro Mosaic region considering ecosystem-based adaptation to climate change
17:20 17:35	Antonio	Lecegui	Institute of Agrifood Research and Technology	Exploring the contribution of forestry and pastoral management practices to Ecosystem Services delivery in Mediterranean silvopastoral systems
17:35 17:45	Amélie Gregory	Robert Valatin	University of Tours, UMR CITERES Forest research	Discussion
17:45 17:50	Amélie Gregory	Robert Valatin	University of Tours, UMR CITERES Forest research	Conclusion

III. ABSTRACTS

Abstracts are ordered based on the session program. The first author is the presenting author unless indicated otherwise.

1. Type of submission: Abstract

B. Biome Working Group sessions: B3 – Forest ecosystem services, water regulation & public policies in the face of global changes

Woodlands for water quality Payments for Ecosystem Services: findings of the PESFOR-W COST Action

First authors: Gregory Valatin
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Diffuse pollution poses long-term chronic risks for over a third of European freshwater bodies. The EU Water Framework Directive (WFD) aims to restore Europe's water bodies to "Good Ecological Status" by 2027, but many Member States are currently struggling to achieve this target. A cost-effective approach to meeting these targets is likely to require mainstreaming incentives such as Payment for Ecosystem Services (PES) schemes to deliver effective, spatially-targeted tree planting and woodland restoration. The PESFOR-W COST Action is a network of researchers and practitioners interested in the potential of woodland measures to help reduce agricultural diffuse pollution to water bodies and includes participants from 40 countries. It has been synthesizing knowledge on the design, environmental effectiveness and cost-effectiveness of existing schemes, creating a spatial repository of woodlands for water PES case studies, and developing guidance for development of new schemes. To help underpin future development of woodlands for water projects, the Action is developing 'look-up' tables that show how key parameters such as the width of buffers affect the environmental effectiveness of woodland creation. An initial evidence review (Pérez Silos, 2017) found that woodlands buffers reduce nitrate concentrations by over 70% on average in both oceanic and Continental climates, with the strength of effect strongly related to buffer width. This presentation will outline some of the main findings of the PESFOR-W COST Action – including examples of woodlands for water PES schemes where different Ecosystem Services provided are paid for by different groups. It will outline the contents of the User Manual on developing Woodlands for Water PES schemes and consider synergies between water quality improvement and climate change mitigation policy agendas.

Keywords: payments for ecosystem services, woodland creation, water quality, cost-effectiveness, carbon-water policy nexus

2. Type of submission: Abstract

B. Biome Working Group sessions: B3 – Forest ecosystem services, water regulation & public policies in the face of global changes

Additionality and leakage resulting from PES implementation? Evidence from the Ecuadorian Amazonia

First authors: Fernando Gordillo

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Payments for Environmental Services (PES) are instruments which seem well suited for forest conservation. However, their impact on reducing deforestation might be weakened by negligible additionality and leakage effects. We examine both issues by assessing the historical deforestation trend of PES enrolled areas and that of their adjacent areas to identify deforestation patterns before and after PES implementation. We analyze the additional effect of PES on reducing deforestation by comparison to a baseline as well as to comparable reference sites at two different spatial scales. We also analyze potential leakage effects of PES by comparing deforestation development in adjacent areas. We show that PES has achieved marginally low conservation impacts in enrolled areas with an average difference in net deforestation rates of 0.02 percent points over a period of 28 years. Overall, PES enrolled areas depict lower annual net deforestation rates than unenrolled areas albeit at a negligible rate. Our empirical results indicate that the choice of PES enrolled areas might have been influenced by self-selection. We present evidence of a decrease in annual net deforestation rates in enrolled and adjacent areas after PES implementation. Additionally, there exists a statistically significant linear increasing deforestation trend in adjacent areas as distance increases from the PES enrolled area.

Keywords: deforestation, additionality, leakage, self-selection, PES

3. Type of submission: Abstract

B. Biome Working Group sessions: B3 - Forest ecosystem services, water regulation & public policies in the face of global changes

Optimisation of land use in the Welsh uplands for reconciling increased tree cover, ecosystem services and agricultural incomes

3rd ESP EUROPE CONFERENCE Tartu, Estonia 2021 7-10 June
Ecosystem Services Science, Policy and Practice in the face of Global Changes

First authors: Ashley Hardaker
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Increasing tree cover is a way to enhance the multifunctionality of agricultural landscapes and enhance ecosystem service provision. Shifts toward greater multifunctionality often lead to trade-offs between other competing objectives such as maximising private financial returns or continued agricultural production. The potential for land use adaptions and transformations involving new tree cover to deliver multiple benefits to multiple stakeholders in the Welsh uplands is currently unclear. This study demonstrates how simple, spatial, multi-objective optimisation techniques can be used to identify optimal land use allocations from a range of strategies for increasing tree cover that minimise trade-offs between public and private ecosystem service benefits, and between ecosystem dis-service costs and financial returns. The results of this study suggest that targeted adaption and transformation of land use in the Welsh uplands to facilitate increasing levels of tree cover (through a range of strategies) could lead to increased ecosystem service benefits (both public and private), reductions in ecosystem dis-service costs and higher financial returns to farmers and landowners. This increased tree cover is optimally delivered through a combination of land-sharing strategies (agroforestry shelterbelt systems and conifer or broadleaf farm woodland systems) and land-sparing strategies (full afforestation with conifers or broadleaves). Land use optimisation suggests there is potential for between 65,000 and 140,000 ha of new tree cover in the Welsh uplands, with at least 60,000 ha of this delivered though land-sharing strategies and adoption of agroforestry shelterbelt type systems. Over the long term, these systems are financially viable without subsidy and allow tree cover to be increased alongside continued and enhanced agricultural production. Overall, these results suggest that in upland agricultural landscapes such as the Welsh uplands, multifunctionality can be enhanced and trade-offs minimised by employing a variety of locally optimal forms of tree cover. Future policy incentives should reflect this.

Keywords: tree cover, ecosystem services, uplands, wales,agricultural incomes

4. Type of submission: Abstract

3rd ESP EUROPE CONFERENCE Tartu, Estonia 2021 7-10 June
Ecosystem Services Science, Policy and Practice in the face of Global Changes

B. Biome Working Group sessions: B3 – Forest ecosystem services, water regulation & public policies in the face of global changes

The Effect of Deforestation on Climate Change

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The emission of carbon dioxide into the atmosphere further deplete the ozone layer leading to climate change. Climate Change result in significant increases in temperature combined with a decrease in rainfall, leading to increased water stress for vegetation and a greater frequency and severity of droughts. A warmer and drier climate will affect the productivity of both forests and agriculture and provoke natural disturbances such as wildfire and pests outbreaks. The vulnerability of forests is of particular concern because forests help to stabilize the land reducing soil erosion and preventing desertification. Reforestation and afforestation is the solution demonstrating the importance of forests to sustainable crop yields and ecological stability. There is an urgent need to develop an Adaptive Sustainable Forest Management (ASFM) strategy. Sustainable Forest Management supports the entire spectrum of benefits that forests provide, including the supply of wood as only one of many ecosystem services. Transition to ASFM supposes substantial changes in all forestry operations including reforestation and afforestation, thinning, forest protection and regulation of final felling, as well as a new understanding of the role of forests in the sustainability of agro-forestry landscapes. Existing forests should be conserved and special measures of protection put in place where they are threatened. In light of expected increase of water stress, special attention should be paid to the selection and use of drought resistant species and provenances, as well as to the creation of seedbanks for the conservation of the gene pool of native trees and shrubs. Monitoring and early warning systems are also needed for assessing feedback of forests to environmental change and extreme climate, the occurrence of invasive species and pest outbreaks. I look forward to the actualization of the United Nations Sustainable Development Goals (SDGs) 7 and 13 which are Clean Energy and Climate Action, respectively.

Keywords: ozone layer, climate change, droughts, reforestation, conservation

5. Type of submission: Abstract

B. Biome Working Group sessions: B3 – Forest ecosystem services, water regulation & public policies in the face of global changes

A DPSIR assessment on ecosystem services in Sredna Stara Planina Mountain, Bulgaria

First authors: Rositsa Yaneva
Other author(s): Miglena Zhiyanski, Eli Pavlova-Traykova, Dimitar P. DimitrovKristiyan Kolev
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Forest ecosystems from Sredna Stara planina Mountain are characterized by rich biodiversity and have key importance in both socio-economic and socio-ecological aspects. The comprehensive analysis of the present environmental risks and cause-effect within an ecosystem over space, time, and stakeholder group is required for ensuring sustainability. The approach of considering the anthropogenic impact and pressure over forests and provisioning of economic benefits their critical role for stabilizing our climate and maintaining ecological diversity could be assessed. The DPSIR framework (Driver-Pressure-State-Impact-Response) is a useful tool to assess and describe the socio-ecological interactions and to achieve better systems-thinking approach for scientists, practitioners, and local stakeholders. It can be also applied to outline measures and to provoke conscious efforts in order to mitigate stress and conflict. This study applies the DPSIR framework to assess any adverse effects of human driven activities on the ecosystem services and to structure knowledge and facilitate empirical research to support sustainable resource consumption and management. We conducted analysis of the main anthropogenic drivers and interlinked pressures in selected regions from Sredna Stara planina Mountain by tackling the various effects on the ecosystem services provided. As result, a set of prevention-orientated measures that respond to the dynamic interactions between the different stressors is presented. The application of the DPSIR approach confirms its potential to provide decision-support, to indicate specific responses, and to raise public awareness of the multilevel anthropogenic impacts.

Keywords: DPSIR framework, forest ecosystem services, mountain ecosystems, resource use

3rd ESP EUROPE CONFERENCE Tartu, Estonia 2021 7-10 June
Ecosystem Services Science, Policy and Practice in the face of Global Changes

6. Type of submission: Abstract

B. Biome Working Group sessions: B3 - Forest ecosystem services, water regulation & public policies in the face of global changes

Make like a tree and leave: How will tree species loss and climate change alter future temperate broadleaved forests?

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In the context of environmental crises', biodiversity loss and climate change, forest creation could provide mitigation or reduction of these. Planting and succession based afforestation are the two main approaches. But disease is a potential preventer of these, a key example in Europe being ash-dieback (Hymenoscyphus fraxineus) which is infecting European ash (Fraxinus excelsior). The needed mitigations for environmental crises', along with losing a species altogether with dieback means afforestation is high on the agendas of environmental institutions and governments. Given decadal timescale required for forest establishment climate change is increasingly likely to act as a species filter, preventing currently observed climax communities establishing. This may create novel no-analogy environments. With UK net-zero goals set for 2050 afforestation can provide carbon sequestration both in above and below ground carbon pools as well as being economically prosperous and mitigating biodiversity loss. It appears that abandoned land takes 30 to 50 years to establish to woodland through succession in the UK, which is too is too slow for 2050 targets. However, there are studies suggesting plantation of temperate forests can lead to establishment in 15 to 30 years. If plantations can establish faster than succession it would be worthwhile to recommend planting of native species as soon as possible for mitigation. To ensure this is a worthwhile finance and time investment we will attempt to predict using and established model workflow how quickly planted forests can be established, by modelling soil variables and indicator species as proxies for ecosystem function and services. Given the UK already has extremely fragmented and degraded habitats would it be

un-wise to abandon them to sort themselves out? Preliminary results suggest that circumstantially soil carbon and nitrogen may increase faster under plantation and some species indicator groups responded well to planting, but others less so.

Keywords: land management, plant ecology, soil, forest ecology, climate change

7. Type of submission: Abstract

B. Biome Working Group sessions: B3 - Forest ecosystem services, water regulation & public policies in the face of global changes

Elaboration of nine Municipal Plans of the Atlantic Forest in Central Rio de Janeiro Mosaic region considering ecosystem-based adaptation to climate change

First authors: Armin Deitenbach
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Municipal Plans for the Conservation and Recovery of the Atlantic Forest (PMMAs) - provided by Federal Law 11,428/2006, known as Atlantic Forest Act, and regulated by Federal Decree 6,660/2008 - constitute an instrument for planning and managing actions aimed at conservation, recovery and sustainable use of the Atlantic Forest at municipal level. Since 2010, several municipalities have started their PMMA elaboration processes, in some cases, carried out jointly and integrated with adjacent municipalities within the same regional context. To encourage the joint and integrated development of PMMAs, Atlantic Forest project promoted the development of nine PMMAs in Central Rio de Janeiro Mosaic (MCF), including the approach to climate change and Ecosystem-based Adaptation (EbA). The selection of ten MCF municipalities that received the support of the project aimed to strengthen and continue the planning and elaboration of PMMAs coordinated by Rio de Janeiro State Secretariat for Environment and Sustainability (SEAS-RJ). The ten selected municipalities were: Cachoeiras de Macacu, Guapimirim, Duque de Caxias, Macaé, Miguel Pereira, Itaboraí, Magé, Tanguá, Nova Iguaçu, and São Gonçalo. Duque de Caxias

decided to disconnect from the project after the constitution of the Working Group and the completion of PMMA Leveling and Presentation Course. Therefore, at the end of the process, nine PMMAs were prepared in the state. The main result was the joint and integrated development of nine PMMAs that included climate change and EbA, covering strategic territories of MCF. Other important results were: elaboration of regional diagnosis; training of technicians in PMMA, diagnosis, mapping, planning, climate change, and EbA; systematization of conservation and environmental recovery actions at intermunicipal and regional levels; use of areas indicated for environmental recovery in the plans and development of the executive forest restoration project in Rio de Janeiro state; recognition of areas designated for environmental conservation.

Keywords: climate change, ecosystem-based adaptation, public policy, atlantic forest, local government

8. Type of submission: Abstract

B. Biome Working Group sessions: B3 - Forest ecosystem services, water regulation & public policies in the face of global changes

Exploring the contribution of forestry and pastoral management practices to Ecosystem Services delivery in Mediterranean silvopastoral systems

First authors: Antonio Lecegui

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Mediterranean silvopastoral systems are an agroforestry land-use type that fulfil a multifunctional role integrating woodlands and livestock farming. Despite their management should be focused on enhancing the optimal supply of Ecosystem Services (ES) bundles while minimizing their trade-offs, a high complexity exists in quantifying the effects of management on the provision of a wide range of ES. In this scenario, expert knowledge emerges as an efficient source of information to complement empirical data. This study aims to assess the influence of

forest and pastoral management practices on ES dynamics in grazed forests in Spanish Mediterranean mid-mountain areas through expert consultations with the Delphi method. A questionnaire was designed to evaluate the impact of 18 management practices over 8 ES through a graduated scale. The set of practices were selected from a literature review along with previous surveys with technicians, forest owners, and farmers in two representative regions of Spain. Following the CICES standardisation, ES were grouped into 2 provisioning services (livestock and timber production), 4 regulating and maintenance services (soil erosion control, wildfire prevention, creation of habitats for biodiversity and carbon sequestration) and, 2 cultural services (offering spaces for hiking and hunting recreational activities). The online survey was administered to a well-established group of researchers and technicians with diverse backgrounds on silvopastoral systems. The Delphi panel was formed by a total of 100 experts in the first round and 65 of them in the second round. Preliminary results illustrate the heterogeneous contribution of management practices to ES delivery. Some practices contribute to the supply of multiple ES while others enhance few specific services and have a low influence on others ES. These findings can support decision-making processes in order to balance production, sustainability, and societal demands in Mediterranean silvopastoral systems.

Keywords: ecosystem services, Delphi method, silvopastoral practices, grazed forest, Mediterranean mid-mountain