Governing and managing forests for multiple ecosystem services across the globe

February 26-28, 2020
Bonn, Germany

Book of abstracts

Silvia Abruscato, Bettina Joa, Georg Winkel (Eds.)

EFI

Conference organization

Conference Scientific Committee

Jürgen Bauhus	Albert-Ludwigs-University Freiburg (ALU-FR)
Erwin Dreyer	L'institut national de recherche pour l'agriculture, l'alimentation et l'environnement (INRAE)
Marcus Lindner	European Forest Institute (EFI)
Bart Muys	Katholieke Universiteit Leuven (KU Leuven)
Davide Pettenella	University of Padova (UNPD)
Irina Prokofieva	Forest Sciences Centre of Catalunya (CTFC)
Helga Pülzl	University of Natural Resources and Life Sciences, Vienna (BOKU)
Andreas Rigling	Swiss Federal Institute for Forest, Snow, Landscape Research (WSL)
Metodi Sotirov	Albert-Ludwigs-University Freiburg (ALU-FR)
Camilla Widmark	Swedish University of Agricultural Science (SLU)
Georg Winkel	European Forest Institute (EFI)
Sven Wunder	European Forest Institute (EFI)

Conference Organization Committee

Silvia Abruscato	European Forest Institute (EFI)
Christiane Düring	European Forest Institute (EFI)
Bettina Joa	European Forest Institute (EFI)
Camilla Widmark	Swedish University of Agricultural Sciences (SLU)
Georg Winkel	European Forest Institute (EFI)

The international conference is organized by INFORMAR and POLYFORES, with the support from ConFoBi, Swiss Forest Lab, oForest, Sincere, ForBioeconomy and NFZ.forestnet.

Several international organizations are cooperating for the setting up of this event: EFI, SLU, University of Freiburg, BOKU, CTFC, NMBU, CEPF, CIFOR, WSL, KU Leuven, University Padova-TESAF, INRAE, IUFRO and Wald und Holz NRW.

Published by:
European Forest Institute
Platz der Vereinten Nationen 7
53113 Bonn, Germany

www.efi.int/resilience
publications@efi.int

Layout: Jose Bolaños
Photo: Silvio Oggioni

The conference received substantial funding through the German Federal Ministry of Food and Agriculture (BMEL) (INFORMAR project), the Swedish FORMAS (POLYFORES project) and the German Research Foundation (DFG) (ConFoBi project).

Recommended citation:
Abruscato, S.; Joa, B.; Winkel, G. (Eds.) 2020. Governing and managing forests for multiple ecosystem services across the globe. Book of abstracts. International conference 26-28 February 2020, Bonn, Germany. European Forest Institute.

ISBN 978-952-5980-82-0

Contents

Preface

Background

Forests are one of the planet's critical life supporting ecosystems. They provide a plethora of ecosystem services for societies, and are subject to various, and often conflicting demands.

Governing and managing forests for multiple ecosystem services has since a long time been an important paradigm. A variety of forest management concepts, such as the landscape approach, sustainable forest management, ecosystem-based management, and multifunctional forestry have been developed to accommodate distinct societal demands in different contexts. Yet, given trade-offs between several forest ecosystem services, under the umbrella of these concepts, quite divergent priorities have been set on the ground, and different spatial management approaches have been taken to accommodate diverging demands on forests (single tree up to landscape approaches). Such forest management approaches need to be embedded in a supportive framework that integrates a large variety of policies and initiatives. They are further connected to various forest related value chains, all impacting how forests are managed in practice. Importantly, several of the influencing factors of forest governance and management are originating from other sectors, such as agriculture, environment, energy, rural development, just to name a few. At the same time, major global challenges and trends, such as climate change, increasing demands for products and services through population and economic growth, and urbanization, affect the way how forests are (and can be) governed and managed.

Conference objectives

The main objective of this conference is to compile and synthesize scientific evidence relating to the current state of "integrated" forest management approaches. We understand integrated forest management approaches as approaches where the objective, at the levels of policy, forest planning and management, is to provide a multitude of services at the same time, either at the forest stand or at the forest landscape level. The conference seeks to bring together academic research on integrated forest management from disciplines such as forest policy analysis, forest ecology, forest economics, forest (ecosystem) management and conservation. It also will engage policy makers and practitioners in a dialogue on how to advance integrated forest management approaches.

The conference invites contributions from different regions of the world addressing the following major questions:

- How are tradeoffs and synergies between different forest ecosystem services perceived, governed and managed across Europe and beyond (incl. segregation/integration debate)?
- What concepts for "integrated forest management" exist, what drives them (policy/markets/environmental changes, societal demands), including implementation in practice, and what are their prospects for the future?
- What do we know about how such management concepts influence the ecological structures and interactions in forests, and how these are linked to specific "outcomes" (biodiversity, ecosystem services)?

Conference Committee

Silvia Abruscato	European Forest Institute (EFI)
Jürgen Bauhus	Albert-Ludwigs-University Freiburg (ALU-FR)
Erwin Dreyer	l'institut national de recherche pour l'agriculture, l'alimentation et l'environnement (INRAE)
Bettina Joa	European Forest Institute (EFI)
Marcus Lindner	European Forest Institute (EFI)
Bart Muys	Katholieke Universiteit Leuven (KU Leuven)
Davide Pettenella	University of Padova (UNPD)
Irina Prokofieva	Forest Sciences Centre of Catalunya (CTFC)
Helga Pülzl	University of Natural Resources and Life Sciences, Vienna (BOKU) Andreas
Rigling Swiss	Federal Institute for Forest, Snow, Landscape Research (WSL)
Metodi Sotirov	Albert-Ludwigs-University Freiburg (ALU-FR)
Camilla Widmark	Swedish University of Agricultural Science (SLU)
Georg Winkel	European Forest Institute (EFI)
Sven Wunder	European Forest Institute (EFI)

Program

Wednesday, 26 February	
11:30 – 12:30	**Registration** (lunch provided)
12:30 – 13:00	**Opening plenary** Welcome addresses
13:00 – 16:00	**Plenary 1: "Tour de planet"** **How are forest governed and managed for multiple services across the globe?** (Chair: Gesche Schifferdecker and Ewa Hermanowicz) Robert Nasi[1] (Director, Center for International Forest Research, CIFOR): Sustainably managing tropical forests: Holy Grail or Fool's Errand? Natalia Lukina[2] (Professor, Russian Academy of Sciences, Moscow): Eurasian Boreal Forests: governance and management approaches for multiple services Christian Messier[3] (Professor, Université du Québec à Montréal): Managing forests for multiple services in large public forests of Canada, US and Australia prone to disturbances: the need for a new approach based on complexity Ulrich Schraml (Director, Professor, Forest Research Institute of Baden-Württemberg): Nobody has any intention of building a wall. Integrated forest management in theory and practice Eduardo Rojas Briales (Professor, Polytechnic University of Valencia): Challenges and opportunities for Mediterranean forests
16:00 – 16:30	Coffee break

[1] Co-authors: Anne Larson (CIFOR), Paolo Omar Cerutti (CIFOR).
[2] Co-author: Karin Beland Lindahl (LTU).
[3] Co-authors: Klaus Puettmann (OSU, USA) and Rodney Keenan (The University of Melbourne).

16:30 – 18:00	**Parallel oral sessions**		
	1. oForest: "Tour D'Europe" (Chair: Frank Krumm/ Andreas Rigling) ▶ Side room 1	**2.** Involving society in managing forests (Chair: Irina Prokofieva) ▶ Plenary	**3.** The role of economics in forest management (Chair: Sven Wunder) ▶ Side room 2
18:00 – 19:00	**Poster-speed talks** Different perspectives on managing forests (Chair: Marcus Lindner) ▶ Entrance Hall		
	P1 The social and political sciences perspectives	P2 The economic perspective	P3 The silvicultural and conservation perspectives
19:00 – 21:00	Networking dinner buffet		

Thursday, 27 February

9:00 – 11:15	**Plenary 2:** **The drivers & outcomes of forest management approaches for multiple services: exploring distinct research perspectives** (Chair: Camilla Widmark) Researchers present what specific disciplines/scientific communities can contribute to the conference questions **Eeva Primmer (Research Director, Professor, Finnish Environment Institute SYKE):** A political science perspective to how forest governance addresses the controversies of preservation, sustainable use and restoration **Jette Bredahl Jacobsen (Professor, Copenhagen University):** An economic perspective of drivers & outcomes of forest management approaches for multiple services: exploring different perspectives **Klaus Puettmann[1] (Professor, Oregon State University):** Putting the horse before the cart – Ecosystem service driven silviculture research **Pierre Ibisch (Professor, Eberswalde University for Sustainable Development):** Forests and multiple ecosystem services: an ecosystem-based conservation perspective
11:15 – 11:30	Coffee break

1 Co-author: Austin Himes (Department of Ecosystems and Society, Oregon State University, USA)

11:30 – 13:00	**Parallel oral sessions**		
	4. Assessing forest management approaches (Chair: Jürgen Bauhus) ▶ Side room 1	**5.** Multiple perspectives on ecosystem services (Chair: Metodi Sotirov) ▶ Plenary	**6.** Ecological structures and functional diversity (Chair: Erwin Dreyer) ▶ Side room 2
13:00 – 14:00	Lunch break		
14:00 – 15:30	**Parallel oral sessions**		
	7. Managing forests in an era of change (Chair: Bart Muys) ▶ Side room 1	**8.** Forest policies and their implementation (Chair: Helga Pülzl) ▶ Plenary	**9.** Ecosystem services: Innovation and Learning (Chair: Davide Pettenella) ▶ Side room 2
15:30 – 18:00	**Field trip to the Kottenforst** (coffee break included)		
18:30 – 19:30	Early buffet dinner in CAESAR venue		
19:30 – 21:15	**Panel Discussion** (public event)**:** **The future of forests managed for multiple services in Europe – where are we heading towards and what can we expect from the "European Green Deal"?** (Chair: Georg Winkel) ▶ Plenary **Eva Müller** (BMEL) **Luc Bas** (IUCN European Regional Office) **Bernhard Budil** (Austrian "Land- und Forstbetriebe") **Mads Jensen** (Danish Nature Agency/Integrate Network Chair) **Humberto Delgado-Rosa** (DG Environment) Scientific interventions by: **Gert-Jan Nabuurs** (Wageningen University & Research) on climate change **Jørgen Bo Larsen** (University of Copenhagen) on forest biodiversity		

Friday, 28 February Note: restricted to invited stakeholders, conference committee, and scientists from Polyfores and INFORMAR project only	
8:30 – 8:45	**Opening plenary**
8:45 – 9:45	**Scientific interventions**
9:45 – 10:00	**Presentation of the key findings**
10:00 – 10:30	Coffee break
10:30 – 11:45	**Parallel science policy workshop**
11:45 - 12:00	Short break
12:00 - 13:00	**Presentation of findings from science policy workshop**
13:00 – 13:15	**Closure**
13:15 – 14:00	Lunch and departure

Oral sessions

Plenary 1: “Tour de planet”: How are forest governed and managed for multiple services across the globe?

2020-02-26
13:00 - 16:00

PLENARY 1.1 - Sustainably managing tropical forests: Holy Grail or Fool's Errand?

Robert Nasi[1]
Anne Larson[1], Paolo Omar Cerutti[1]

[1] Center for International Forest Research, CIFOR

Corresponding email: r.nasi@cgiar.org

For several decades, we have been seeking "sustainability" in tropical forests in relation to evolving societal demands. We have discussed "strong vs. weak sustainability," "integrated forest management", "multiple-use forest management" and more, ad nauseam, with only limited successes to show for all these efforts. We are still losing forests because of a mix of inadequate governance and outdated management paradigms.

Integrated management has been tried from reductionist technical perspectives integrating resource use with limited support for local livelihoods. Less often has integration considered wider considerations: Who should 'own' the land on which activities should (or not) occur? Who should have the right to 'govern and manage' such schemes, or even set the rules for governance and management?

This is a call to go beyond the technical to a political approach to integration. Tropical forests cannot be considered a patchwork of individual pieces given out to this or that investor and expect that 'integrated' management will magically occur. In 2019 many countries have seen protests emerging in response to growing inequality. Population and its demands will soon more than double. Without changes in political regimes and priorities, sustainability will not be the outcome.

Urgency requires immediate action for tropical forests. Millions of youth demand a better future. How to convince them that integrated forest management is a better bet than business-as-usual? For these youth, integrated forest management must mean innovative ways of approaching, understanding and using forests: e.g. social media solutions to better governance or new policies and laws emerging from the imaginations of the young people who will implement them.

Concurrently, the old, tired and sometimes corrupt-by-the system officials should step aside while support is provided to the innovation capacity of rural youth. Smart (and truly decentralized) governments will draw on the 'entrepreneurial' capacity of the local 'private' sector, with legitimate and responsible forest owners in charge of implementation. A legitimate State will maintain the power to monitor and sanction if 'integrated management' goes off track, and to provide support when asked.

PLENARY 1.2 - Eurasian Boreal Forests: governance and management approaches for multiple services

Natalia Lukina[1]
Karin Beland Lindahl[2]

[1] Russian Academy of Sciences, Moscow
[2] Luleå University of Technology, Luleå

Corresponding email: nvl07@yandex.ru

Boreal forests make up 38 percent of the world's forest area, more than half is located in Russia and Scandinavia. Russia and Sweden are major forest producing countries facing similar challenges related to climate change and biodiversity conservation. Both countries provide forest ecosystem services (FES) for local, regional, and global use, but display important differences in terms of forest governance and management. Whereas Russia applies a predominantly segregative approach with elements of integration, Sweden promotes an integrative model with elements of segregation. We apply a cross country comparative approach to explore the significance of these different management approaches for the capacity to deliver provisioning, cultural and regulating FES. An interdisciplinary approach is used to illustrate how different governance, policy- and management approaches impact biodiversity and FES provision in boreal forest landscapes. We compare how Russian and Swedish forest policy and management have responded to climate related challenges; how the two systems deal with goal conflicts; and how they handle trade-offs and synergies between different FES. While both countries experience tradeoffs between timber production, on the one hand, and biodiversity and recreation, on the other, the relationships between timber production and climate mitigation are portrayed in different ways.

PLENARY 1.3 - Managing forests for multiple services in large public forests of Canada, US and Australia prone to disturbances: the need for a new approach based on complexity

Christian Messier[1]
Klaus Puettmann[2], Rodney Keenan[3]

[1] Université du Québec à Montréal, Canada
[2] Oregon State University, USA
[3] The University of Melbourne, Australia

Corresponding email: ch.messier@gmail.com

In this talk, we will review how large public forests of Canada, USA and Australia prone to disturbances are being governed and managed for multiple services. For each region, similarities and differences will be highlighted. Although timber is still the prominent service being managed for in all three regions, recent efforts have been done to incorporate biodiversity, games, carbon and recreation. In most cases, however, these other factors are considered as constraints since they do not bring incomes. Particular approaches being implemented include variable retention, functional zoning (or TRIAD), longer rotation and reduced-disturbance risk management. Recent efforts to factor in climate change are also being discussed in all three regions. We will argue that novel forest management approaches are needed to help forests adapt to future increasingly uncertain biotic and abiotic conditions and threats.

PLENARY 1.4 - Nobody has any intention of building a wall. Integrated forest management in theory and practice

Ulrich Schraml

Corresponding email: ulrich.schraml@forst.bwl.de

PLENARY 1.5 - Challenges and opportunities for Mediterranean forests

Eduardo Rojas-Briales

Corresponding email: edrobr@prv.upv.es

Mediterranean forests are characterized by inverse temperature and rainfall patterns and important and early human presence leading to extensive cultural landscapes. Recent intense urbanization processes and public afforestation policies have speed up forest recovery especially in hilly and mountainous areas. Direct profitability of most Mediterranean forests is marginal and additionally exacerbated by strong estate fragmentation and considerable forest fire risk, especially in the non Balcanic EU countries. In the rest of the basin forests are state owned with considerable differences regarding the public forest service performance. Increased inter-Mediterranean cooperation has allowed a growing consensus in the diagnosis: the need to tackle the market failures of a resource that provides critical environmental and social services but with very limited market-based income. Integrating climate change adaptation and mitigation, disaster risk reduction (fires, landslides and floods), rural-urban linkages, biodiversity, agriculture, tourism and bioeconomy while designing the most efficient and feasible policy mix and its sustainable finance is due.

1. oForest: "Tour d'Europe"

2020-02-26
16:30 - 18:00

O1.1 - Policy and legal framework for the forest biodiversity nexus: taking stock of the integration of production and conservation in European forests

Metodi Sotriov[1]
Tobias Schulz[2], Georg Winkel[3]

[1] Chair of Forest and Environmental Policy, Faculty of Environment and Natural Resources, University of Freiburg
[2] Eidg. Forschungsanstalt für Wald, Schnee und Landschaft WSL, Umwelt- und Ressourcenökonomie
[3] European Forest Institute, Governance Programme

Corresponding email: metodi.sotirov@ifp.uni-freiburg.de

This presentation summarizes the main findings presented in a book chapter of the oForest project that investigates how policies governing integrative and segregative nature protection in forests have evolved at the international and European level. It also reviews the design and implementation of these policies in different national and sub-national contexts. The chapter compiles the respective evidence from different policy levels and across various European countries.

This chapter has elaborated on the structure of norms, rules and practices regarding forest biodiversity at different levels and how they have evolved recently. While important impulses were given from outside of forest policy at the international, particularly also the EU-level, by nature conservation policy (Natura 2000), there is also a history of bottom-up development of corresponding norms and rules within the forest sector. The latter very much depends on the importance of the forest sector, forest ownership structure and recreation demands of urbanized regions.

Of all the international rules and guidelines mentioned, the EU's nature directives have most prominently and effectively shaped forest biodiversity rules in EU member states. Nature conservation objectives had to be integrated into forest policy, and particular measures supporting these objectives had to be operationalized on the ground by corresponding forest management plans targeting certain habitats or species on the Natura 2000 surfaces. As the Natura 2000 policy hardly provides for specific or sufficient financial means to compensate private and corporate forest owners for the costs, EU funds for agriculture are being tapped into, which creates goal conflicts as originally the money was not meant to promote the non-utilization of forests.

Interestingly, forest biodiversity concepts and compensation schemes have also been developed at about the same time outside of the jurisdiction of the EU, namely in Switzerland. Other than in Germany, however, this was dependent on a stronger integration of nature conservation and forest policy at the national level and it required national financial means to provide a proper compensation scheme for municipal and private forest owners.

O1.2 - Different ownership structures and their consequences for forest management

Jerylee Wilkes-Allemann[1]
Eva Lieberherr[1]

[1] ETH Zürich, Dep of Environmental Systems Science, Natural Resource Policy Group

Corresponding email: jwilkes@ethz.ch

Keywords: forest owner types, policy instruments, Austria, Germany, Sweden, Switzerland

Forests in Europe are multifunctional, as they provide several ecosystem services to society. The provision of these services is contingent on forest management, which in turn is dependent on forest ownership. Due to societal and political developments in the last three decades, forest ownership has been changing in Europe. These changes lead to challenge forest management. For instance, there is an increasing number of forest owners with small parcels and forest owners often no longer reside close to their forest parcels. In turn, active management decreases. Understanding the interactions between ownership and current management approaches is, therefore, of importance in light of the desired and expected forest ecosystem services. Based on secondary data, we analyse the changing ownership structures in Europe, and specifically in Austria, Germany, Sweden and Switzerland. We selected these countries due to certain structural similarities. The analysis shows that the main drivers of forest ownership change are privatisation and restitution (e.g. Germany and Sweden), as well as changing lifestyles of forest owners (e.g. Austria, Germany, Sweden and Switzerland). We can conclude firstly that changes in ownership structures lead to a growing diversity of forest owner types and imply the revision of forest management approaches and policy instruments. Secondly, we find that new owners bring new management goals, attitude, skills and capacities. Subsequently, new forest management approaches are required. Third, new goals and attitudes can bring innovation in the forestry sector.

O1.3 - Bioeconomy – potentials for innovation and sustainability regarding wood utilization and forest management

Bart Muys[1]
Gabriele Weber-Blaschke[2]

[1] Forest Ecology and Management Research Group, Division Forest, Nature and Landscape, KU Leuven
[2] Resource Flow Management Research Group, Chair of Wood Science, Technical University of Munich

Corresponding email: bart.muys@kuleuven.be

After revisiting the meaning of bioeconomy this perspective paper explores the options of the forest and wood sector to contribute to the bioeconomy through traditional and innovative wood use. Novel applications such as engineered wood products have a large potential to substitute fossil energy intensive materials. In this context environmental assessment methods, in particular life cycle assessment, are crucial to increase resource efficiency and optimize cascading use of wood products. But sustainability also implies input-related impacts caused by the wood sourcing in the forest. Wood production and harvesting can cause impacts on forest structure and function, and on other ecosystem services, that need to be addressed through good silvicultural practice. We conclude that sustainable timber has a large potential to contribute to the circular bioeconomy when it combines sustainable forest management with sustainable wood conversion and use.

O1.4 - Forests in climate change: Increasing adaptability and resilience through greater diversity and heterogeneity

Anke Höltermann[1]

[1] Federal Nature Conservation Agency (BfN)

Corresponding email: Anke.Hoeltermann@BfN.de

The presentation elaborates on the background and contents of the current BfN position paper "Forests in climate change" which was published as a preparatory document for the national forest summit of the BMEL in September 2019, which was supposed to show ways of coping with the current forest damage in German forests. The BfN demands for forests to be developed in such a way that they can cope with the changes in climate change, adapt or reorganise, while keeping basic functions and ecological services. Irreversible developments should be prevented through robust and flexible measures at various levels of risks in order to preserve resilient forests. Some concrete and particularly controversially discussed demands on forest management will be presented as examples.

O1.5 - „Resilience“ – the new buzzword – or does this concept cover the challenges in forest management?

Marcus Lindner[1]
Laura Nikinmaa[1]

[1] European Forest Institute, Resilience programme

Corresponding email: marcus.lindner@efi.int

How to respond to and mitigate climate change is probably the largest challenge in European forest management since overcoming wide-spread forest degradation in the 17th to the 19th century. As it remains difficult to forecast our future climate and because of considerable uncertainty how future climate extremes and disturbances will affect forests there is increasing interest to make European forests more resilient to undefined future conditions. This presentation will first review different definitions of resilience and discuss if this concept can be useful to guide forest management under a changing climate. Although there is a lot of confusion about the meaning of the term, it is proposed that the different views do not contradict each other, but rather reflect different scopes and system boundaries, which can be integrated in a common framework. In the second part, some recent challenges in forest management will be illustrated, stressing that business as usual management might not be the best strategy to deal with ever increasing extreme events and disturbances in forests. Active management interventions that increase forest resilience are suggested to provide indeed a new type of guidance that may allow a more effective way of handling the challenges posed by climate change.

O1.6 - Vision of nature conservation in Swiss Forests

Claudio de Sassi[1]
Bruno Stadler[1], Markus Bolliger[1], Reinhard Schnidr

[1] Federal Office for the Environment, Wildlife and Forest Biodiversity section

Corresponding email: claudio.de-sassi@bafu.admin.ch

Keywords: Switzerland, multifunctionality, forestry close to nature, backwash theory

Longstanding and diverse forestry traditions in Switzerland have in many ways contributed to multifunctional forests long before the concept was formulated. Yet, not all functions and services were born equal. Biodiversity conservation was typically confined to backwash theory, which only partly preserved one of the most important biodiversity reservoirs in the country. Nowadays, the federal law gives equal weight to forest's functions and their associated services, thus providing a mandate for multifunctionality. The linearity of this principle juxtaposes to the faceted biogeographical and cultural nature of the country. The plurality of interests, small-scale ownership structures and biophysical heterogeneity challenge the implementation of national strategies for conservation. The defining challenge lays however beyond the forest margins: a vision for nature conservation must address forest-specific deficits, but ultimately needs to expand its scope to the wider landscape, tackling sectoral barriers to ecosystems and biodiversity conservation.

O1.7 - Close-to-nature forest management and nature conservation: A Danish example of a multifunctional forest

Mogens Krog[1]

[1]Danish Nature Agency

Corresponding email: mokro@nst.dk

Keywords: Close-to-nature forest management, set aside forest, forest resilience, forest transition

The case of Rold forest is the case of a Danish state forest with multipurpose functions including timber production, biodiversity conservation and recreation. During the last 25 years nature conservation efforts at multiple scales have been developed and expanded. Rold forest is a forest complex of 8000 ha of which 2300 ha is stat forest. It is an old forest dominated by conifers primarily Norway spruce and exotic conifers and to a less extend beech. Conifers were planted during the last 200 years whereas the beech is dominated by older native stands. Since 2005 a national close-to-nature forest management strategy has been applied in the state forests, with the aim of converting even-aged single tree species stands to mixed diversified stands based on natural regeneration. The aim is to develop forests that are more resilient towards climate change and calamities such as storms and diseases. The transition will to take at least one tree generation (80-120 years) and facilitate forest development that will provide more options for future generations regarding forest products, ecosystem services and nature conservation.

A storm in 2005 opened up the forest and kick-started the conversion process. Restoration of a number of smaller open areas: forest meadows, small lakes and mires was part of the overall nature conversion effort.

In 2016 it was decided to expand the state forest area to be set aside for nature conservation from 5% to 20%, in order to meet international biodiversity targets. In Rold Forest, two areas with a total size of 380 ha are set aside. The objective is to select larger connected forest areas to be set aside for biodiversity conservation based on data on the presence of threatened species. The selected forest areas include young and old even aged stands, thus a 10 years transition period is applied for active restoration in order to diversify even aged stands and eradicate exotic species. Other forest restoration measures include active promotion of tree microhabitats and dead wood, restoration of forest wetlands and introduction of grassing animals to maintain open habitats.

O1.8 - The intercommunal group for the management of Auberive's forests – A case study from eastern France

Yoan Paillet[1]
Jean-Jacques Boutteaux, Benoit Meheux

[1] Univ. Grenoble Alpes, Irstea, Lessem, Grenoble, France

Corresponding email: Yoan.Paillet@irstea.fr

Keywords: habitat trees, wood harvesting, ecological network, uneven-aged management

The public forest of Auberive (Haute-Marne, Eastern France) comprises more than 16 500 hectares of broadleaf-dominated stands. Historically treated as coppice-with-standards until the 30s, then as high forests, it has been gradually converted to uneven-aged management from the beginning of the 90s until today. The four main principles are : (i) Working for and improving the quality of trees individually, whatever their species, age, spatial distribution and dominance; (ii) Ensuring perennial regeneration and renewal everywhere, notably preserving the mixture of tree species, ages and dimensions to increase the overall resilience (either ecological or economical); (iii) Harvesting trees at their economical optimum, defined as a compromise between diameter, quality and tree species: the higher the quality, the higher the harvesting diameter; (iv) Insuring optimized and regular revenues, while decreasing natural and artificial regeneration costs. This aim is a consequence of the application of the three previous orientations. The economic and ecological results are now quantified through a network of 1350 permanent plots to monitor capital and forest state, and the site serves as a training ground for further conversions to uneven-aged forest elsewhere, notably through the use of marteloscopes.

2. Involving society in managing forests

2020-02-26
16:30 - 18:00

O2.1 - Supply, demand and innovations of forest ecosystem services in Europe

Marko Lovric[1]
Mario Torralba[2], Tobias Plieninger[2, 3], Sven Wunder[4], Eeva Primmer[5], Jeanne-Lazya Roux[6], Monica Hernandez-Morcillo[7], Lasse Loft[8], Francesco Orsi[9], Davide Pettenella[10], Carsten Mann[7], Georg Winkel[6]

[1] European Forest Institute, Bioeconomy programme, Joensuu Office, Finland
[2] Faculty of Organic Agricultural Sciences, University of Kassel, Kassel, Germany
[3] Department of Agricultural Economics and Rural Development, University of Göttingen
[4] European Forest Institute, EFIMED Office, Barcelona
[5] Finnish Environment Institute, Helsinki, Finland
[6] European Forest Institute, Resilience programme, Bonn Office, Germany
[7] Eberswalde University for Sustainable Development, Germany
[8] Leibniz Centre for Agricultural Landscape Research, Germany
[9] Landscape Architecture and Spatial Planning Group, Wageningen University & Research, The Netherlands
[10] University of Padova, Italy

Corresponding email: marko.lovric@efi.int

Keywords: forest ecosystem services, supply, demand, innovations, spatial data

Forest provide multiple ecosystem services such as timber, carbon sequestration, hydrological regulation and recreation. All of these fall within the ecosystem service framework, which has become one of the most important paradigms in forest planning and management. Although studies mapping their supply in Europe exist, this data has never been based on international-level responses from forest owners and managers. The benefits of this supply are spread to a wide societal level, but the costs are mostly bared locally by forest owners and managers. An important factor in sustainability of this supply is assuring that forest owners and managers also receive some benefits, which are in this study proxied with profitability of forest management and development of innovations.

In order to address these issues, we have disseminated a European-wide survey aimed at forest managers and owners to (i) assess the supply of ecosystem services of their forest, (II) assess the profitability-concerns related to this supply (III) map-out innovations related to ecosystem services and IV) comment on the perceived societal demand for individual ecosystem services. All responses are made with a reference to a specific geocoded forest area, which allows for linking of responses to spatially explicit data bases. The survey was distributed by the membership networks of Confederation of European Forest Owners, the European Landowners Organization, European Federation of Municipal Forest Owners and the European State Forest Association. The most important feature of results is linking the supply, perceived demand and innovations related to forest ecosystem services to forestry data bases. This has enabled development of the ecosystem services bundles typology, where each type is in turn statistically linked to basic data on forests that provide them.

O2.2 - How do citizens perceive and value forest ecosystem services?

Pülzl, H.[1], Aggestam, F. [1], Pecurul-Botines, M.[2], Lukina, N. V. [4], Sotirov, M.[3], Tebenkova, D.[4], Widmark, C.[5] and Rosinger, C.[1]

[1] Institute of Forest, Environmental and Natural Resource Policy, Department of Economic and Social Sciences and EFI Forest Policy Research Network
[2] Forest Science and Technology Centre of Catalonia, Crta. de St. Llorenç de Morunys a Port del Comte, km 2, 25280 Solsona, Spain.
[3] Chair of Forest and Environmental Policy, University of Freiburg, Tennenbacher Str. 4, 79106 Freiburg, Germany
[4] Centre for Forest Ecology and Productivity of the Russian Academy of Sciences, 117997 Profsoyuznaya st. 84/32, Moscow, Russia.
[5] Dep. of Forest Economics, Swedish University of Agricultural Sciences , and Forest Economy Network, SE-90183 Umea, Sweden.

Corresponding email: helga.puelzl@boku.ac.at

Keywords: survey, forest ecosystem values assessment, citizens perceptions

Forests provide different products and services that go well beyond the provision of biomass, clean air and biodiversity. Those include e.g. benefits in terms of climate regulation, human health, recreation, refuges, fresh water supply, and soil protection. Non-wood goods and food such as game meet, mushrooms, berries are provided in addition to erosion control as well as the protection against avalanches and rock fall in mountain areas. Those products and services are summarized by the term forest ecosystem services (FES). Evidence from older work on public perceptions of forests indicates that European citizens mostly value forests for being “nature”, and more recent work indicates a related challenging gap between societal and forest industrial perceptions. What has however not been investigated systematically so far is the fact that people hold complex and plural values that they are also express towards forests and that different trade-offs between different FES are expected to be found based on the individual values.

Therefore, this article aims to assess how do citizen perceive FES, what synergies and trade-offs in relation to the provision and usage of FES they see and finally what roles values play in shaping their attitudes towards FES prioritization. In order, get a broader picture on citizens’ perceptions and values a quantitative survey was implemented in Sweden, Russia, Germany, Catalonia and Austria in the context of the POLYFORES project. All selected countries& and Catalonia are rich in forest resources and it can be expected that citizen know and use forests. The main hypothesis is, that human value types are better predictors of the relative importance of FES to the respondent, than socio-economic and demographic context variables.

O2.3 - Integrated management of urban and peri-urban forests: the case of seven Danube cities

Tina Simoncic[1]
Jurij Kobe[2], Matjaz Harmel[3], Robert Hostnik[1], Andrej Boncina[4]

[1] Slovenia Forest Service, Slovenia
[2] City of Ljubljana, Slovenia
[3] ZaVita, d.o.o., Slovenia
[4] University of Ljubljana, Biotechnical Faculty, Department of Forestry and Renewable Forest Resources, Slovenia

Corresponding email: tina.simoncic@zgs.gov.si

Keywords: multiple interests, ecosystem services, forest planning, governance, urban forest management plan

Management of urban forests is a great challenge due to extremely wide and diverse range of interests in commonly limited forest area. Provision of ecosystem services (ES) in public interest is even more demanding in an environment dominated by private ownership and governed by a set of different institutions and individuals. In such cases, traditional forest management planning approaches are insufficient as they put a great deal of attention to the production role of forests and to the top-down planning approach. Our objective was to design a comprehensive planning framework for management of urban and peri-urban forests (UPF). The framework includes an integrated multi-use management planning at the strategic and operational level. The strategic planning includes setting strategic objectives, spatial priorities and guidelines for management, and defines the governance frame. Operational planning is a tool for the implementation of the activities and measures in UPF. It defines detailed governance structure, control and monitoring mechanisms, and costs and financing of the prescribed measures. The novelty of our study is a collaborative planning procedure of UPF management between city administration and forest planners, and an intense public participation. The management planning framework has been tested on UPF of seven Danube cities: Belgrade, Budapest, Cluj-Napoca, Ivano-Frankivsk, Ljubljana, Vienna, and Zagreb. In all case studies, participation approach in the form of several workshops has been used to reveal demands for ES, to find mitigation strategies for dealing with conflicting uses, to harmonize public and private interests, and to set appropriate measures for the provision of desired ES. The elaborated management plans present important tools for both forestry and city administration in managing UPF, and provide a basis for broader environmental policy making with a special focus on climate mitigation measures and insuring well-being of urban societies. The planning framework can serve as an example for other regions across the globe facing similar challenges in managing UPF. The research is financed by the URBforDAN project, co-financed by the European Union Funds (ERDF, IPA, ENI).

O2.4 - A multifunctional forest management based on stakeholders' involvement: an application in three Balkans rural areas

Marta Crivellaro[1]
Maurizio Camin[2], Giacomo Colle[1], Guido Zolezzi[3], Marco Bezzi[1], Alessandro Paletto[4]

[1] EFFETRESEIZERO srl, spin-off supported by "Consiglio per la ricerca in agricoltura e l'analisi dell'economia agraria (CREA), Trento (Italy)
[2] Associazione Trentino con i Balcani (ATB) ONLUS, Trento (Italy)
[3] Dept. of Civil Environmental and Mechanical Engineering University of Trento (Italy)
[4] Consiglio per la ricerca in agricoltura e l'analisi dell'economia agraria (CREA), Forestry and Wood Research Centre, Trento (Italy).

Corresponding email: marta.crivellaro@f360.it

Keywords: participatory process, ecosystem services, SFM, Participated River Management, Balkan region

The participatory process in the natural resources management in Balkan region is a key point to achieve social sustainability of decisions and strategies in forest and river management. From the theoretical point of view, an inclusive and transparent participatory process can facilitate the exchange of information between decision makers and the local community, reduce conflicts between users, and increase social acceptance of the natural resources management outcomes.

The study – developed in the "FOR Balkans" project – has two main objectives: (1) stakeholders' engagement in the development of natural resources management scenarios; and (2) the implementation of a Spatial Decision Support System (SDSS) to enhance sustainable and multifunctional forest and river management. In order to achieve the above-mentioned objectives a face-to-face survey was conducted in three pilot areas in Balkan region: Shkrel Valley (Albania); Rugova Valley (Kosovo); Knjazevac Municipality (Serbia). The three pilot areas are in rural context and they are characterized by strong linkages of the local community to the natural resources for provisioning and supporting needs.

The questionnaire was administered to a representative sample of stakeholders, approximately 15 in each pilot area. The stakeholders were selected among four main groups of interest: public administrations; environmental NGOs, tourism promoters and forest owner associations. The questionnaire, provided as a digital application, was formed by 26 closed-ended and open-ended questions. It has investigated, also with the use of dedicated maps, stakeholders' perception and opinions about forest and river resources, ecosystem services, and sustainable management practices.

The results show the need of a participatory process to increase the knowledge awareness and to facilitate a two-way communication between public authority and local community. The collected data was used to develop and calibrate a SDSS for multifunctional forest and river management in order to maintain and improve the ecosystem services supply.

SDSS implementation in rural and marginal areas in the Balkan region could enhance the multifunctional management of natural resources based on community knowledge.

O2.5 - Application of an integrated assessment approach to support forest management decision making at landscape level

Mireia Pecurul-Botines[1]
Jordi Garcia-Gonzalo[1], Irina Prokofieva[1]

[1] Forest Science and Technology Centre of Catalonia (CTFC)

Corresponding email: mireia.pecurul@ctfc.es

Keywords: Forest ecosystem services, integrated assessment, participatory modelling, conflicts and trade-offs

The aim of this research is to better understand how could assessing ecological, cultural and economic values impact forest planning at landscape scale. For this reason, the focus is set on an integrative methodology to assess forest ecosystem services (FES). Despite the growing literature addressing FES, there is still a gap in cultural and socio-economic assessment of different FES and integrating this knowledge into traditional modelling tools for forest planning. An integrative approach has the potential to add value to the process as it can elicit the underlying values that inform actors' decisions. Moreover, by connecting the cultural and socio-economic assessment of different FES to policy drivers, it can enhance the delivery of FES.

While most FES valuations are performed at a national or regional scale (Bryce et al., 2016); our work focuses on a local scale in order to better integrate local differences and values into decision-making in a forestry context. Our participatory methodology consisted of several stages involving different types of stakeholders: First, we reviewed potential drivers and indicators through workshops and interviews with key stakeholders; Second, we developed three policy scenarios that were tested with experts and we developed forest management criteria for each; Third, we used participatory modeling to discuss FES trade-offs and synergies taking into account cultural and socio-economic impacts of each choice.

We conclude that adding a deliberative dimension into valuation process might help to elicit actors' weights, socio-economic and cultural values of FES and make better-informed choices. Moreover, participatory modeling approach challenges the inherent power asymmetry in expert-based modeling of local context, and therefore enhances local acceptability of FES-related decisions.

3. The role of economics in forest management

2020-02-26
16:30 - 18:00

O3.1 - Synergies and trade-off between carbon offsets, biodiversity conservation and economic surpluses in the Norwegian forest sector

Hanne K. Sjølie[1]
Clara Anton-Fernandez[2], Jogeir Stokland[2], Luiz Goulart[1], Greg S. Latta[3], Birger Solberg[4], Rasmus Astrup[2]

[1] Inland Norway University of Applied Sciences
[2] Norwegian Institute of Bioeconomy Research
[3] University of Idaho
[4] Norwegian University of Life Sciences

Corresponding email: hanne.sjolie@inn.no

Keywords: Bio-economic modeling, climate change mitigation, forestry, forest simulations, multi-use forestry

Forests supply several ecosystem services important for human well-being, like timber for processing in industry, carbon sequestration and storage and biodiversity. In several countries, policies aim to increase the use of wood to replace fossil fuels and at the same time increase forests' carbon offsets and to better conserve biodiversity. Conflicting findings exist in the literature about the relationships between these goals. The objective of our study was to analyze trade-offs and synergies between economic outputs, carbon offsets and biodiversity at the national scale in Norwegian productive forests. We projected forest growth and yields together with harvests, industrial processing, consumption of wood products and trade across the Norwegian forest sector to map future economic outputs, carbon offsets and biodiversity. Biodiversity was given as an index, with old-growth trees and dead wood being important for an area to have high biodiversity. Carbon offsets were calculated as net yearly sectoral fluxes, from alive and dead biomass, soil, emissions from machineries, processing and combustion of wood, substitution effects and changes on wood products carbon stocks. Climate-sensitive forest simulations were run with three sets of climate scenarios. We also simulated a climate policy given as carbon subsidies and taxes on sequestration and emissions of €50/tCO_2eq. Preliminary results show that given levels of harvests at current levels and up to 50 % higher, net carbon offsets level off after the turn of the century if no climate policy is implemented. In the presence of this policy, offsets continue to grow also after year 2100. Further, we found that for all forest types, the area shares with high biodiversity grow and will be substantially higher in year 2150 than in 2020 under all harvest and climate scenarios. These area shares increase more as the climate warms, as tree growth is enhanced. In the absence of large-scale calamities, lower harvest level implies higher carbon offsets over the next 150 years, albeit the offsets converge with time. Economic sectoral outputs increase with harvest levels, while in the presence of climate policies surpluses are higher in the bioenergy sector and lower in the pulp and paper sector.

O3.2 - Regionalisation of forest ecosystem services' values in Germany (ReWaLe): A multiple benefits-transfer model

Peter Elsasser[1]
Kerstin Altenbrunn[1], Margret Köthke[1], Martin Lorenz[1], Jürgen Meyerhoff[2, 3]

[1] Thuenen Institute for International Forestry and Forest Economics, Hamburg (Germany)
[2] TU Berlin (Germany), Institute for Landscape Architecture and Environmental Planning – Landscape Economics
[3] Christian Albrechts University Kiel (Germany), Institute for Environmental, Resource and Regional Economics

Corresponding email: peter.elsasser@thuenen.de

Keywords: environmental valuation, benefits transfer, forest ecosystem services, regionalisation, Germany

The goal of the ReWaLe model is, first, to exploit the available knowledge about the monetary value of forest ecosystem services in Germany applying benefits transfer analyses; second, to close respective gaps by additional primary studies; and third, to link valuation results to regional conditions at the administrative district (NUTS-3) level. This allows for regionalised value comparisons between competing demands for different forest ecosystem services under the status quo, as well as for scenario analyses of alternative forest utilisation options.

We present the general structure of the model and of the individual modules currently implemented (timber production, climate protection, recreation, several nature protection services within managed forests, and the establishment of additional nature protection areas). Methodologically, the valuation of timber production and climate protection is based at an analysis of available quantity and price data. The recreation value is estimated by applying a benefit function transfer approach to an existing data set, which used Contingent Valuation to value the right to visit forests in the vicinity of each respondent's place of residence. Nature protection services in managed forests and in additional protection areas are valued by a primary study which establishes a generic valuation function for each of the services, using choice experiments as the valuation methodology.

Results are presented for the status quo under current forest management, as well as for some management scenarios that are derived from alternative forest utilisation strategies currently under discussion. A comparison of the individual ecosystem services' values reveals clear regional patterns, which are driven by the interaction between the distribution of forests and the population, as well as by the distances between forests and population centres. These patterns can be used to increase the effectiveness of traditional "multifunctional forestry", taking into account the regional variation of demand for different forest ecosystem services.

O3.3 - Economic and environmental impacts of the European Forest Ecosystem policies on environmental leakage through international trade

Alexander Moiseyev[1]
Birger Solberg[1]

[1] Norwegian University of Life Sciences, Ås, Norway.

Corresponding email: alexander.moiseyev@nmbu.no

Keywords: environmental leakage, nature conservation, carbon storage, international trade

We studied possible Forest Ecosystem Services (FES) future policy development alternatives in Europe and investigated what consequences these alternatives would have on forest ecosystem services and global harvest and carbon leakage effects. The partial equilibrium forest sector model EFI-GTM has been applied to investigate future wood and wood products developments under different possible global development pathways and a number of policy alternatives, including three of particular relevance to forests in Europe: (i) enhanced nature conservation, (ii) enhanced carbon storage in forests and (iii) intensified wood bioenergy supply.

The focus of this study was to analyze the consequences of the alternative policies on forest sector in Europe and globally. The studied policy alternatives had contrasting effects on ecosystem services in European forests and these effects were regionally variable. Policies favoring nature conservation and carbon storage in forests were more likely to reach the desired European ecosystem services goals, but these were associated with global harvest and carbon leakage effects. The policy impacts are discussed and conclusions are drawn for future European forest ecosystem policies, with specific attention to regional differences and the choices that society has between alternative pathways and the trade-offs that are associated with these.

O3.4 - Payment for Ecosystem Service Water (PESFOR-W); Assessing the cost-effectiveness of forests and woodland for water quality service

Rasoul Yousefpour[1]
Paola Acando[2], Tom Nisbet[3], Gregory Valatin[3], Serge Garcia[4], Jens Albidtrup[4]

[1] University of Freiburg, Germany
[2] The James Hutton Institute, Aberdeen
[3] Forest Research, UK
[4] INRAE

Corresponding email: rasoul.yousefpour@ife.uni-freiburg.de

Keywords: PES assessment, Cost-effectiveness, Environmental services, Nature-based solutions

Payments for Ecosystem services (PES) have emerged over the last decades to encourage practices fostering positive environmental outcomes. The evaluation of the cost effectiveness of PES to achieve relevant sustainable policy goals has been a core of the scientific debate on PES implementation. PES effectiveness can be hampered by diverse environmental, institutional and socio-economic factors as well as barriers operating at different spatial and temporal scales. Moreover, it can be affected by potential synergies and trade-offs in the provision of ecosystem services (ES), and climatic risks and uncertainties. Nowadays, payments for water service are of particular interest, as maintaining and managing forests/woodlands, and planting trees and shrubs are increasingly considered as effective nature-based solutions. These would enhance various watershed services such as filtration to reduce diffuse pollution, regulating stream flows, controlling erosion and sediment load, and protecting against extreme events (e.g. floods and landslides). We report the findings from the EU Cost Action PESFOR-W, drawing on the evidence base from a range of studies on forest benefits for water to /examine how to respond to the specific challenges involved in evaluating the performance of forest-based solutions to enhance water quality. Particular attention is given to the estimation of additionality in the provision of water quality service, and to spatial and temporal heterogeneities of PES opportunity and implementation costs. A general conceptual framework is presented to evaluate cost-effectiveness of forest for water PES and tested using a case-study of a forest-based action for water protection in Denmark. Finally, the paper discusses the implications and lessons drawn from state-of-the-art approaches to PES cost-effectiveness analysis, and identifies future research needs to improve the implementation of efficient and sustainable forest and water resource policies.

Plenary 2: The drivers & outcomes of forest management approaches for multiple services: exploring distinct research perspectives

2020-02-27
09:00 - 11:15

PLENARY 2.1 - A political science perspective to how forest governance addresses the controversies of preservation, sustainable use and restoration

Eeva Primmer[1]

[1] Finnish Environment Institute SYKE

Corresponding email: Eeva.Primmer@ymparisto.fi

The ecosystem services concept permeated the biodiversity conservation policy agenda at the start of the Millennium, generating fierce debates at the frontier of biodiversity conservation and ecosystem service provision. In forests, the controversies could form around differing sustainability strategies: whether ecosystems services lend support to preservation of valuable habitats and endangered forest-dependent species, whether sustainable use of wood generates tradeoffs with other, more diversity dependent, ecosystem services, and whether active restoration by planting trees, justified with e.g. carbon sequestration targets, promotes or even undermines biodiversity. However, it appears that the forest sciences and forest policy address these dilemmas in a non-controversial fashion, possibly seeking to avoid conflict, possibly just because the idea of ecosystems representing stocks that generate flows of benefits has appeared intuitive for the forest sciences and forest policy. This has resulted in an apparently smooth capture of the ecosystem services concept. Focusing on the framings of preservation, sustainable use and restoration in science, management, policy and politics, my talk will draw attention to the ways in which sensitive issues are governed in the forest sector at different levels. I will draw a conclusion that addressing sensitive issues and controversies is a precondition for developing sustainable governance of forest ecosystem services provision.

PLENARY 2.2 - An economic perspective of drivers & outcomes of forest management approaches for multiple services: exploring different perspectives

Jette Bredahl Jacobsen

Corresponding email: jbj@ifro.ku.dk

From the economic system there is a demand for various goods and services from forests. Which goods and services are being demanded changes over time, depending on, among other things, economic growth, and the availability of substitutes. This changes over time, causing that the outcome of forest management must also change. Thus, working with a forest management system that provides a constant flow of goods and services over time, is seldom relevant. Rather we need to look at how it can be adapted to the changing needs – and also, how the changing needs affects forest management. This will be discussed based on current changes in demand – and values, of carbon sequestration and storage, timber production, biodiversity conservation.

PLENARY 2.3 - Putting the horse before the cart – Ecosystem service driven silviculture research

Klaus Puettmann[1]
Austin Himes[1]

[1] Oregon State University, Department of Ecosystems and Society, USA

Corresponding email: klaus.puettmann@oregonstate.edu

Silvicultural research has traditionally focused on investigating impacts of management practices on measures describing forest structure and composition. The first step into expanding this research into ecosystem services (ES) is to explicitly include measures (or proxies) describing a variety of ecosystem services as response variables. This allows identification of which ecosystem services respond in sync (positively or negatively, linear or threshold patterns) versus services with unrelated responses. Results from our recent work suggest that similarly responding groups of ESs can reflect their reliance on a common subset of structural and compositional characteristics. Furthermore, as the quantity and diversity of desired ES increases, the likelihood of trade-offs increases as well. In this context, future silviculture research can be setup to efficiently provide insights into relationships between desired ES. Analytical approaches, such as multi-dimensional response surfaces, can provide direct guidance about potential opportunities for integration and benefits of segregation of selected ecosystem service provision. However, silviculture research studies can typically only provide information about the potential capacity for ES provision for two reason. First, because additional factors, such as weather extremes or invasive diseases, affect forest structure and composition as silvicultural practices are applied over larger areas and longer time periods. Second, because under certain conditions, factors other than forest structure and composition are influencing ecosystem service provision, e.g., when social triggers rather than habitat determine wildlife populations. Incorporating such issues and their associated uncertainties is crucial when basing policy and management decisions on silvicultural research efforts, especially in a world driven by global change.

PLENARY 2.4 - Forests and multiple ecosystem services: an ecosystem-based conservation perspective

Pierre L. Ibisch[1]

[1] Eberswalde University for Sustainable Development

Corresponding email: pierre.ibisch@hnee.de

Especially in the context of adaptation to climate change, the discourse on ecosystem-based approaches and nature-based solutions is booming. Often, this is not underpinned by up-to-date ecological knowledge. However, modern ecosystem theory and system ecology provide insights needed for getting to grips with ecosystem functionality. In times of multiply stressed ecological systems under accelerating environmental change, functionality is an overarching conservation target becoming more relevant than simple pattern or structure-related objectives. Key ecological attributes comprise the structures, processes and emergent properties required for maintaining viable, resistent and resilient biological and ecological systems. Systems managed for functionality, which includes an adaptive resilience, provide a wealth of regulating ecosystem services urgently needed by socioeconomic systems suffering from global change-induced stresses. Thus, it is easy to justify an ecosystem-based approach to conservation fostering self-organizing and regulating functions, allowing for synergies with adaptation to climate change and sustainable landscape management. Nevertheless, this will only be achieved if the primacy of provisioning, extraction-based ecosystem services is abandoned. Clearly, this implies the necessity to embrace sufficiency strategies.

4. Assessing forest management approaches

2020-02-27
11:30 - 13:00

O4.1 - Integrating ecosystem services and resilience in sustainable forest management

Laura Maebe[1, 2]
Hugues Claessens[1], Marc Dufrêne[2], Kevin Maréchal[3], Christian Messier[4, 5]

[1] Forest is Life, Faculty of Gembloux Agro-Bio Tech, University of Liège, Gembloux, Belgium
[2] Biodiversity and Landscape, Faculty of Gembloux Agro-Bio Tech, University of Liège, Gembloux, Belgium
[3] Modelling and Development, Faculty of Gembloux Agro-Bio Tech, University of Liège, Gembloux, Belgium
[4] Institute of Temperate Forest Science (ISFORT), University of Québec in Outaouais, Ripon, Québec, Canada
[5] Center for Forest Research (CEF), University of Québec in Montréal, Montréal, Québec, Canada

Corresponding email: laura.maebe@uliege.be

Keywords: Ecosystem services, resilience, forest, sustainability

In the Anthropocene era, humanity has substantially shaped the ecosystems to meet the growing demand for provisioning ecosystem services (ES) but at the same time, it has considerably altered the functioning of the Earth system leading to completely novel and unpredictable effects. Resilience, ES and sustainability have gained tremendous popularity, over the last decades, in the scientific, policy and management arenas to address these challenges. However, less attention has been paid to the relationships between ES and resilience and how these concepts interact with sustainability. We, therefore, analyzed the concepts of ES and resilience, their relationships, strengths and weaknesses to determine how resilience and ES could be together operationalized for sustainable forest management.

This analysis is based on a literature review and on interviews with leading experts in the field of resilience and/or ES. These two sources of information are complementary as the scientific literature synthetizes a long thinking process while the interviews gather main thoughts and opinions.

The analysis shows that resilience and ES are closely intertwined in several ways. On one hand, resilience determines the capacity of an ecosystem to provide ES in the face of disturbances and is influenced, in turn, by human actions taken to response to changes in ES. On the other hand, resilience is defined as the ability to maintain ES. Resilience is sometimes even included in some ES classifications. Finally, these two concepts are applied together in forest management, for example to maintain a desired set of ES in the face of disturbances.

The resilience approach contributes to improve the ES approach and vice versa: the resilience approach introduces the temporal dimension in the ES approach while the ES approach helps integrating the multiple dimensions, scales, methods and points of views as well as their interactions in the resilience approach. Resilience may be mandatory to ES and vice versa as a loss of resilience/ES could jeopardize ES/resilience. In conclusion, pairing ES and resilience is essential to promote policies toward sustainable forest management. However, caution should be exercised to avoid traps of one concept overriding the other.

O4.2 - Assessment of multiple ecosystem services and integration into forest management plans in the Mediterranean

Pinar Pamukcu-Albers[1]
Yıldıray Lise[1], Özge Balkız[1], Uğur Zeydanlı[1]

[1] Nature Conservation Centre, Ankara, Turkey

Corresponding email: pinarpamukcu@hotmail.com

Keywords: Forest ecosystem services, forest management plans, watershed management

Forest ecosystems provide diverse benefits to humans, including water flow regulation, freshwater provisioning, soil conservation, tourism and recreation, and non-wood forest products. In addition to these benefits, the monetary value of forest ecosystem services provides sufficient data about the costs induced by services loss.

Our study areas spread over five districts of Mediterranean forests in Turkey, covering about 6 500 km². Most of the forests are made up of maquis and Calabrian Pine *(Pinus brutia)*. In the past, forest management plans for these areas focused mostly on timber production. In this study, we assessed water flow regulation and soil conservation services from forest ecosystems at sub-watershed level within the five forest districts. We quantified flood-torrent risk using hydrologic and topographic negative and positive factors and water flow regulation by determining flow coefficients for all land-uses. We determined erosion risk prevention using Revised Universal Soil Loss Equation, and modelled these water-related services and validated them through field surveys, stakeholder workshops and expert views. We determined forest stands along hiking routes and proposed management activities for these stands in forest management plans. The economic valuation of forest ecosystems was assessed in one of the districts for carbon storage, wood production, and recreation services.

The results showed that watersheds with the highest flood-torrent risk were characterized by slopes of 17 percent and higher, forest density below 48 percent and more than 3.7 percent of impervious areas at sub-watershed level. The share of runoff in precipitation events ranged from 40.51 (forests) to 92.49 (impervious areas) percent. In the economic valuation we found that the carbon storage had a value about 5 times greater than that generated through wood production.

In the end, in collaboration with the General Directorate of Forestry in Turkey, we developed management actions to enhance forest ecosystem services in five districts. These forestry practices included different silvicultural options at forest sub-stand level. In Turkey, this innovative approach was implemented for the first time in the management planning process of forests. Our approach is an example of successful integration of multiple ecosystem services into forest management plans.

O4.3 - MultiForest – Management for multifunctionality in European forests in the era of bioeconomy

Clemens Blattert[1, 2]
Kyle Eyvindson[1, 2, 3], Mikko Mönkkönen[1, 2]

[1] University of Jyväskylä, Department of Biological and Environmental Science, P.O. Box 35, FI-40014 Jyväskylä, Finland
[2] University of Jyväskylä, School of Resource Wisdom, P.O. Box 35, FI-40014 Jyväskylä, Finland
[3] Natural Resources Institute Finland (Luke), Latokartanonkaari 9, FI-00790 Helsinki, Finland

Corresponding email: clemens.c.blattert@jyu.fi

Keywords: policy, forest management, trade-offs, ecosystem services, multifunctionality

Forests are subject to various social, economic and ecological demands. A plethora of European and national sector policies guide forest use, often with competing objectives and management paradigms. Sectoral policy implementation is often not coordinated, and the impacts are not monitored across the policies and the scales. The inconsistency between policies may negatively impact the sustainability and multifunctionality of forests, particularly in the era of bioeconomy and its increasing timber demands.

The main objectives of this recently started multi-national scale project with partners from FIN, NOR, SWE, GER and AUT is to: i) analyse the impacts of European and national policies on multiple forest ecosystem services and biodiversity (ESB), ii) identify (in)coherences between policies and assess sustainability gaps stemming from policy incoherence, and iii) to identify feasible policy pathways and management actions to increase long-term forest multifunctionality.

To establish appropriate indicators and quantitative future demands for ESB, each country will translate relevant bioeconomy, biodiversity and national forest policy documents into policy scenarios. Expected timber demands are assessed by the Global Biosphere Management Model (GLOBIOM). Each partner will link the ESB and timber demands to long-term forest simulation outcomes based on NFI-data. Multi-objective optimisation will be applied to develop compromise management programs at landscape scales for each policy scenario. The compromise solutions will be evaluated using multifunctionality metrics assessing the impact policies can have on ESB and multifunctionality, and (in)coherences among policy scenarios (cross-sectoral & cross-scale). National stakeholder panels will be established to provide perspectives on managing and developing the bioeconomy at a European level and to analyse policy implementation pathways for an increased future policy coherence.

The cross-policy analysis method is novel in its breadth and multidisciplinary collaboration and we expect results revealing incongruence between European and national sectoral policies. We aim to generate knowledge and tools for decision-makers to improve policy coherence and integrate forest, bioeconomy and biodiversity policies. We anticipate that coordinating land-use planning will enable efficient resource utilisation and provision of ESB and minimizes losses to multifunctionality from intensified land-use. By focusing on boreal and temperate forest ecosystems, results are important for large parts of Europe.

O4.4 - Assessing the interactions between the multiple forest ecosystem services with integrated modeling approach: Russian case studies

Natalia Lukina[1]
Daria Tebenkova[1], Vladimir Shanin[1, 2], Sergey Chumachenko[1, 3], Pavel Grabarnik[2], Oleg Chertov[4], Sergey Kondratyev[5], Dmitiy Zamolodchikov[1], Larisa Khanina[6], Pavel Frolov[2], Sergey Bykhovets[2], Maxim Bobrovsky[2], Yuri Karpechko[7], Marina Shmakova[5], Anna Dulina

[1] Centre for Forest Ecology and Productivity of the Russian Academy of Sciences, 117997 Profsoyuznaya st. 84/32, Moscow, Russia
[2] Institute of Physicochemical and Biological Problems in Soil Science of the Russian Academy of Sciences, 142290 Institutskaya st., 2, bld. 2, Pushchino, Russia
[3] Mytischi Branch of Bauman Moscow State Technical University, 141005 1st Institutskaya street, 1, Mytischi, Moscow region, Russia
[4] University of Applied Sciences Bingen, Berlinstraße 109, 55411 Bingen am Rhein, Germany
[5] Institute of limnology of the Russian Academy of Sciences, 196105 Sevastyanova st., 9, St. Petersburg, Russia
[6] Institute of Mathematical Problems of Biology – the Branch of the Keldysh Institute of Applied Mathematics of the Russian Academy of Sciences, 142290 Vitkevicha st., 1, Pushchino, Russia
[7] Karelian Research Centre of the Russian Academy of Sciences, 185910 Pushkinskaya St., 11, Petrozavodsk, Karelia, Russia

Corresponding email: shaninvn@gmail.com

Keywords: forest ecosystem services, synergie, trade-off, integrated modeling, ecological indicator

All ecosystems are multifunctional, however, assessing the relationship between ecosystem functions and services remains problematic. The objectives were to assess in different forest management and climatic scenarios (1) trade-offs between timber harvesting and carbon sink in forests of the European part of Russia at regional level with model ROBUL, and (2) synergies and trade-offs between different FES using integrated modeling approach through several case studies at local level. The objects for case studies at local level were selected in boreal (Republic of Karelia) and mixed coniferous-broadleaved (Moscow region) forests. FES were assessed with the combination of several simulation models: FORRUS-S model for assessing timber and non-timber resources as well as forest recreational capacity, Romul_Hum and SCLISS models for assessment of carbon accumulation, CO_2 emission and mineral nitrogen release in forest soil, BioCalc model for estimation of plant functional diversity, and models ILHM and ILLM for runoff and nutrients removal estimation. For assessing synergies and trade-offs between FES at local level all involved models were integrated using a common protocol of data exchange. Inertial, basic and strategic scenarios for forest management at regional level were taken into account. Different forest management scenarios for assessment at local level were elaborated using the INTEGRAL project approach. Climate change scenarios corresponded to Paris Agreement limits were developed according to the IPCC Fifth Assessment Report. For analysis of modeling results at local level the most informative ecological indicators of forest sustainable development were identified, that are completeness of ontogenetic spectra of the predominant tree species, ratio between ecological-coenotic groups of plants, forest carbon sink and recovery time of water run-off etc.

The growth of clear-cutting area according to above-mentioned scenarios resulted in a serious reduction in carbon sink to forests at regional level, up to conversion to a carbon source. Both synergies and trade-offs between FES were also identified at local level.

Thus, we have shown that the integrated set of simulation models, coupled with a system of environmental indicators, can be used as a tool for making forest management decisions at the local and regional levels, which allows maintaining a balance between FES.

The work was funded by Ministry of Science and Higher Education of the Russian Federation (unique project's identifier RFMEFI61618X0101) in frames of the FP7 ERA-NET Sumforest – POLYFORES project

5. Multiple perspectives on ecosystem services

2020-02-27
11:30 - 13:00

O5.1 - Patchy legislative landscape of non-native forest tree species in Europe

Elisabeth Pötzelsberger[1]
Katharina Lapin[1, 2], Giuseppe Brundu[3]

[1] Institute of Silviculture, University of Natural Resources and Life Sciences, Vienna
[2] Austrian Research Centre for Forests (BFW), Vienna
[3] Department of Agriculture, University of Sassari, Sassari

Corresponding email: elisabeth.poetzelsberger@boku.ac.at

Keywords: Non-native tree species, legislation, Europe, forestry, invasive alien species

Non-native tree species (NNT) have been used in European forestry already for several centuries. The share of NNT in the forest cover, their economic importance and the perceived ecological risk, however, largely varies across Europe. In addition, countries respond with their national policies and legislation differently to supernational frameworks like European Union directives or international treaties and conventions on forestry and nature conservation. This results in diverse policy approaches and a wide range of regulatory intensities concerning NNT.

In this study we (1) identified the most relevant legal instruments governing the use of NNT in forestry, and (2) analysed, categorised and mapped national and subnational legal strategies pertaining to the regulation of NNT in 40 EU and non-EU European countries (all except microstates). A number of European countries have relevant legislation at subnational level (regions, provinces). For this reason, over 100 legal entities had to be analysed separately.

Data collection included questionnaires sent to over 60 country experts and the search for relevant legislation in FAOLEX and ECOLEX databases. We reviewed several hundred of legislative acts and identified over 300 acts relevant for the regulation of NNT. We developed suitable legislation indicators and categories to formally describe and compare NNT regulation approaches and intensities among the legal entities.

Our study revealed a remarkably broad range of regulatory intensity within the European legislative landscape, ranging from not dealing with non-native trees to total prohibition of the use of NNT in forestry. Depending on the country/region, legislation may govern the import of NNT into the country, prohibit the introduction of NNT into nature, limit the species choice for planting, enforce approval mechanisms for planting and ecological risk assessment, demand respecting certain species mixtures, a maximum (continuous) area of NNT or areas/cases where NNT are excluded. Our findings are relevant for considerations about the option of using NNT for climate change adaptation and mitigation of European forests as well as for initiatives and policies aiming at combating potentially invasive alien species, some of which may be NNT.

O5.2 - Governing forest ecosystem services in Europe: a sustainability self-assessment process with and for practitioners

Nathalie Pipart[1]
Bart Muys[1], Constanza Parra[1]

[1] KU Leuven, Department of Earth and Environmental Sciences

Corresponding email: nathalie.pipart@kuleuven.be

Keywords: PES, Europe, sustainability, tool, transdisciplinarity

Through the perspective of the ecosystem services (ES) concept, one of the major current challenges relating to the management of Europe's forests is the need to balance the provision of distinct forest ES with broad societal demands. It is perceived as requiring innovations in terms of the spectrum of ES addressed and the type of mechanisms (from novel policies to governance and business models). In the last two decades, Payments for Ecosystem Services (PES) and Market-Based Instruments (MBI) have been officially promoted as the new "win-win" solutions. They have been attracting increasing interest, including recently in Europe. However, there is still a lack of empirically-based and context-specific definitions and identification of their sustainability issues in Europe.

We report here an ongoing research in SINCERE (a European H2020 funded project, 2018-2021, https://sincereforests.eu/) on the design and implementation of forest governance innovations. These innovations are being developed with a transdisciplinary approach in 11 case studies spread mainly over Europe. Our case studies present a variety of innovation profiles: e.g. from introduction of market logic in subsidy systems (Belgium) to new institutions for cooperation between stakeholders and design of a fund acting as intermediary in a PES scheme (Spain).

Through qualitative research and participatory action-research methodologies, our research aims at 1) analyzing the sustainability issues arising in the design and implementation processes of those innovations, 2) co-constructing a sustainability self-assessment tool with the practitioners partners in the project. We will report the lessons learned so far from this ongoing multi-phase co-construction process. We used an adapted Delphi technique to collectively define, with all project partners, a set of sustainability Principles and Criteria specific to the kind of governance mechanisms being developed. On this basis, each case study carried out a first participative qualitative assessment with local stakeholders and is moving toward identification of indicators.

With this transdisciplinary approach, we aim at co-producing knowledge that is directly relevant and applicable for action. The purpose is to provide support for our case studies and eventually to further inform research and action on the potential and limits for governance of the trade-offs between plural sustainability objectives.

O5.3 - Payments for Water Ecosystem Services: the stakeholders' point of view

Alessandro Paletto[1]
Klára Báliková[2]

[1] Consiglio per la ricerca in agricoltura e l'analisi dell'economia agraria (CREA), Forestry and Wood Research Centre, Trento (Italy).
[2] Technical University in Zvolen, Faculty of Forestry, Department of Economics and Management of Forestry, Zvolen (Slovakia).

Corresponding email: alessandro.paletto@crea.gov.it

Keywords: Payments for ecosystem services; forest management; stakeholder analysis; questionnaire survey

Forests provide a wide range of ecosystem services related to the water resource such as water purification, groundwater and surface flow regulation, erosion control, and streambank stabilization. Recently, some studies have highlighted that the forest management practices – e.g., thinning, conservation practices, afforestation/reforestation actions – have an important positive impact on supplying of the water ecosystem services. In this context, the Payments for Ecosystem Services (PES) schemes offer a promising voluntary mechanism to increase the supply and compensating the cost of forest management in order to improve the quality and quantity of water. The aim of this study is to analyse the stakeholders' opinions related to the relationship between forests and water; the trade-offs between ecosystem services generated by forest management practices, and the potential development of water-related Payments for Ecosystem Services (PES) schemes. The study was developed in the context of COST Action CA15206 "PESFOR-W" (Forest for Water), that aimed to synthesise current knowledge about the PES schemes. The stakeholders' point of views and preferences were collected through an online survey using a semi-structured questionnaire formed by 20 questions divided into four thematic sections. At the end of data collection, the opinions of 142 of stakeholders from 23 countries were collected and statistically analysed. The data were processed distinguishing between four groups of stakeholders (buyers, sellers, intermediaries, and knowledge providers). The results show that most important category of water ecosystem services according to all groups of stakeholders are regulating services followed by provisioning services, while cultural services are considered the least important. In the regulating services category, according to the stakeholders the most important ecosystem services are the reduction of soil erosion and surface runoff. Besides, the stakeholders emphasized the high importance of shared values among stakeholders and direct changes in land management when designing water-related PES schemes. Stakeholders also highlighted the important role of public authorities both as buyer and as regulator and the involvement of different groups of stakeholders in the decision-making process. The results of this study can be considered a starting point for designing PES schemes taking into account the social preferences and opinions.

O5.4 - (Re)discovering spiritual forest ecosystem services: European and Asian perspectives

Jeanne-Lazya Roux[1]
Tobias Plieninger[2, 3], Georg Winkel[1]

[1] European Forest Institute, Resilience programme, Bonn Office, Germany
[2] University of Göttingen, Department of Agricultural Economics and Rural Development, Germany
[3] University of Kassel, Faculty of Organic Agricultural Sciences, Germany

Corresponding email: jeanne-lazya.roux@efi.int

Keywords: Cultural ecosystem services, Spiritual values, Forest management, Innovations

Humans have traditionally had a strong cultural and spiritual connection with forests. Increasing population, urbanisation and work pressure have led to new ways in which people relate to forests through cultural ecosystems services (CES).

Spiritual ecosystem services and values of forests, a subgroup of cultural ecosystem services, are defined by the MEA 2005 report as "*sacred, religious, or other forms of spiritual inspiration derived from ecosystem services*". The term 'spiritual' does not only refer to religious aspects, but to all aspects of the human inner character and feelings

Spiritual and emotional connections to forests can be of great importance for forest policy and management, resulting in the protection of forests, or implying a specific kind of management that enhances the supply of ecosystem services. Moreover, in a market-driven society, commercialization of such services may take place, e.g. through "funeral forests" (cemeteries in forests).

Research available on cultural ecosystem services is limited (though growing), but the focus is usually on recreational and aesthetic values, rarely on spiritual values. This often leads to the underestimation of their important role in ecosystem conservation.

The aim of this study is to review and compare existing knowledge on spiritual values from European and Asian perspectives and to understand the importance of spiritual values for the human-nature relationship, forest governance and forest management. We also investigate aspects such as the historical context and how spiritual values as a CES are perceived by different policy and management stakeholders in a series of countries.

To tackle these questions, we apply a qualitative review methodology combining literature review with a selected set of interviews in case studies in different countries in Europa and Asia.

References

MEA (Millennium Ecosystem Assessment) (2005) "Ecosystems and Human Well-being: Synthesis". Island Press, Washington, DC

SINCERE (2018) "Spurring Innovations for forest Ecosystem SERvices in Europe" (a European Union Horizon 2020 research and innovation programme under grant agreement No 773702)

O5.5 - Policy Changes and Emerging "Ecosystems Services Forestry (ESF)" & "Forest Services Industry" in Japan

Shingo Shibata[1]

[1] Sophia University, Japan

Corresponding email: s-shibata-t5t@sophia.ac.jp

Keywords: Policy Changes, Ecosystem Services Forestry, Forest Services Industry

Although narrowly focused timber forestry has long been a dominant paradigm, interests on broader, interdisciplinary, multifunctional forestry and land use are also emerging in Japan. In my presentation, I will highlight the recent trends of societal needs and forest policy changes in Japan including the Forest and Environmental Tax, concepts of "Ecosystem Services Forestry" and "Forest Services Industry", and some examples of such practices and future prospects.

Japan's current 10 million ha of the plantation: approximately 40% of the total forest area, are mostly monoculture of two conifer species, and half of them were established through the conversion of natural forests. After forestry fell into a deep slump, many plantations were left unmanaged with unhealthy conditions of least biodiversity and protection functions, so promoting proper management of these plantation areas became increasingly challenging and important. In order to remedy the situation, prefectural-level Forest and Environmental Tax was first established in 2003, and subsequently majority of prefectures followed suit. In 2018, establishment of a similar tax at national level was finally agreed.

"Ecosystems Services Forestry" is a term I proposed at Society of American Foresters Convention in 2017 to illustrate holistic, integrated forestry activities aimed to provide broader bundles of ecosystem services, including various Non-Wood Forest Products & services explored to be traded through PES and similar mechanism. "Forest Services Industry" is a term recently proposed by the Forestry Agency to mean interdisciplinary forest-based businesses related to human health, tourism and education. Although implementation of such practices is still nascent and fragmented, the author believes there is a good potential for such new dimension to expand through transformative blending of traditional culture and innovations.

6. Ecological structures and functional diversity

2020-02-27
11:30 - 13:00

O6.1 - Sentinel forests: a network for analyzing interactions between climate, humans and forest ecosystems in France

Yoan Paillet[1]
Nicolas Debaive[2], Eugénie Cateau[2], Vincent Augé[3], Virginie Girard[4], Nicolas Gouix[5], Catherine Julliot[6], Lise Maciejewski[7, 8], Isabelle Meurillon[9], Xavier Morin[10], Clara Therville[11], Laurent Tillon[12]

[1] Univ. Grenoble Alpes, Irstea, Lessem, Grenoble, France
[2] Réserves Naturelles de France, Dijon, France
[3] Parc National de la Vanoise, Chambéry, France
[4] Univ. Grenoble Alpes, CNRS, Irstea, LTSER France, Zone Atelier Alpes, Grenoble, France
[5] Conservatoire d'espaces naturels Midi-Pyrénées, Toulouse, France
[6] Ministère de la Transition Ecologique et Solidaire, Paris, France
[7] MNHN, CNRS, AFB, UMS 2006 PatriNat, France
[8] Univ. de Lorraine, AgroParisTech, INRAE, UMR Silva, Nancy, France
[9] GIP du Futur Parc National des Forêts de Champagne et Bourgogne, Leuglay, France
[10] CEFE / CNRS, Montpellier, France
[11] Observatoire des Forêts Sentinelles, Dijon, France
[12] Office National des Forêts, Paris, France

Corresponding email: yoan.paillet@irstea.fr

Keywords: Social-ecological systems, climate change, monitoring, adaptive management, biodiversity

Forests are complex social-ecological systems subject to global changes that are increasing the speed of interactions, multiplying the connectedness within social-ecological systems and leading to potential shifts towards undesirable states, such as forest diebacks. In this context, it is essential to develop long-term research initiatives that facilitate the assessment of the multiple interactions between forest ecosystems, climate and humans, and enable cooperation and involvement of both practitioners and researchers. Such a challenge involves inter- and trans-disciplinary approaches to assess the multiples facets of sustainable forest management and provide users with adaptive management solutions. In this context, French forest managers together with researchers in ecology and social sciences launched a network of Sentinel Forests, a long-term observatory whose objective is to bring together forest and natural areas managers, policymakers and other stakeholders to monitor ecosystems-climate-human interactions in forests. The Sentinel Forests observatory historically comprises a forest monitoring national network, mostly located in forest reserves and protected areas with various degrees of human intervention, from traditional forest management to strict protection for several decades. Forest structures, comprising living and dead trees as well as specific structures such as microhabitats, were measured over more than 150 sites and 10 000 permanent plots, some of which have recently been remeasured, 10 years after the first measure. This protocol provides insights living trees and deadwood dynamics and can be compared to other references including national forest inventories. With regard to this pre-existing tool and emerging challenges, the Sentinel Forests observatory has two main objectives : i) assess the capacity of these pre-existing tools, and potentially adapt them, to analyze climate-ecosystems-human interactions at a large scale, and ii) set-up more intensive sites – called master-sites – where uses and practices in relation to climate change and biodiversity could be more precisely investigated and monitored on the long run. It will thus favor collective learning of forest social-ecological system within a perspective of adaptive forest management. The scientific strategy, where

stakes and questions are built-up by managers and scientists together, will be published at the beginning of 2020 and set the research plan for the forthcoming ten years.

O6.2 - Understanding alignment among multiple ecosystem services and biodiversity across different modes of forest restoration to guide restoration designs

Fangyuan Hua[1, 2]
Paula Meli[3], Phillip A. Martin[2], Christopher McEvoy[2], L. Adrian Bruijnzeel[4], Pedro H. S. Brancalion[3], Pete Smith[5], David P. Edwards[6], Andrew Balmford[2]

[1] Institute of Ecology, Peking University
[2] Department of Zoology, University of Cambridge
[3] Department of Forest Sciences, University of São Paulo
[4] Department of Geography, King's College London
[5] Institute of Biological & Environmental Sciences, University of Aberdeen
[6] Department of Animal and Plant Sciences, University of Sheffield

Corresponding email: fhua@pku.edu.cn

Keywords: biodiversity, carbon storage, soil erosion control, water provisioning, co-benefit

To limit global temperature increase within 2ºC above preindustrial levels, governments worldwide have pledged hundreds of million hectares of Forest and Landscape Restoration (FLR) by 2030. Key to maximizing FLR's gains lies in adopting restoration approaches that best deliver across multiple outcomes. Focusing on carbon storage, biodiversity, soil erosion control, and water provisioning, we use a global meta-analysis of 1,206 records to identify which restored tree covers best deliver these environmental wins and how this varies across the world's forest biomes.We found that native forests clearly outperform tree plantations across all outcomes, delivering higher aboveground biomass (+6-19%), species abundance (+14-57%), soil erosion control (+57%), and water provisioning (+50%). Moreover, these advantages tended to be greater closer to the tropics. These findings underscore the imperative to restore native forests where timber production is not an aim. However, given the real potential for FLR to alleviate pressure on environmentally incomparable primary forests and achieve maximum overall gains by providing timber, current knowledge gaps on how timber production aligns with the environmental outcomes assessed here urgently need to be filled to guide FLR designs.

O6.3 - Reconstructing past disturbance regimes across conifer and broadleaf forests of central Europe as a baseline to guide forest management

Miroslav Svoboda[1]
Vojtěch Čada[1], Thomas A. Nagel[1, 2], Lucie Vítková[1], William S. Keeton[3]

[1] Czech University of Life Sciences, Faculty of Forestry, Kamýcká 129, Praha 6 Suchdol, Czech Republic
[2] Biotechnical Faculty, Department of Forestry, and Renewable Forest Resources, University of Ljubljana, Vecna Pot 83, Ljubljana, 1000, Slovenia.
[3] University of Vermont, Rubenstein School of Environment and Natural Resources, 81 Carrigan Drive, Burlington, VT, USA

Corresponding email: svobodam@fld.czu.cz

Keywords: ecological forestry, biodiversity,

Until recently, understanding of the dynamics of European forest ecosystems was largely based on equilibrium theory, whereby relatively continuous low intensity mortality of canopy trees maintained a steady-state patch mosiac in late seral stands and landscapes. However, over the last decade numerous empirical studies have shown that disturbances strongly influence dynamics across a range of forest types in Europe. Working in two forest ecosystems in the temperate zone of Europe, our goal was to reconstruct disturbance regimes at multiple spatial scales. We attempted to answer following questions. Are widespread stand replacing disturbances part of the natural range of disturbance variability in spruce forests or do they reflect a legacy of past management? Are beech forests driven by the small-scale gap dynamics or do periodic intermediate to higher severity disturbances play an important role in their dynamics? We used highly spatially and temporally resolved tree ring data from over 15 000 trees and more than 500 plots to reconstruct the past 300 years of disturbance history. The results indicate that both forest types were characterized by a mixed-severity disturbance regime. Moreover, despite high spatio-temporal variability of historical disturbances observed on the plot level, we found evidence of disturbance synchronization at the meso-scale, suggesting these forests are not in equilibrium even at large spatial scales. For spruce forests, broad peaks of disturbances were evident across many sites in the 1820 – 1830, 1850 – 1890, and 1910 – 1930 periods. For beech forests, we found that tree mortality was variable over time; while most decades experienced low severity disturbance, periodic peaks in disturbance were also observed. An important conclusion of this work is that past synchronization of disturbances at the meso-scale level may set the stage for another round of future disturbance events, which may be augmented by climate change. Our quantitative estimates of the disturbance characteristics could be directly linked to decisions related to forest management. These results will be discussed in the context of forest management strategies that either integrate or segregate ecological and economic functions in the study region"

O6.4 - Tree-related microhabitats as selection criteria for habitat trees in close-to-nature forest management in the Black Forest

Thomas Asbeck[1]
Patrick Pyttel1, Jürgen Bauhus[1]

[1] Chair of silviculture, University of Freiburg

Corresponding email: thomas.asbeck@waldbau.uni-freiburg.de

Keywords: habitat trees, retention forestry, Black Forest, tree-related microhabitats

Forest management needs to provide solutions for the safeguarding of biodiversity in forested landscapes. For this purpose, forest managers and scientists should develop "best practices" that are evidence-based and which improve the multiple-use of forests.The development of integrative conservation concepts is a relatively recent one (Kraus and Krumm, 2013), at least for forest areas that are managed under close-to-nature forestry (Bauhus et al., 2013). In other forest ecosystems which are managed under different silvicultural approaches, as boreal clear-cut systems, the idea of integrative conservation has been implemented for almost three decades under the term of retention forestry (Gustafsson et al., 2012).The goal of this study was to provide evidence for the development of "best practices" for the implementation of integrative conservation in the Black Forest. The study focused on the selection criteria for living, large habitat trees based on tree-related microhabitats (TreMs) (Larrieu et al., 2018). The results of this study provide insights into the use of TreMs as selection criteria for retention elements. Forest type, mean tree dimension and altitude influenced abundance and diversity of TreMs at the plot-level. This allows an adaptation of forest management strategies to maintain or increase the provisioning of TreMs by altering forest composition and structure. For instance, a greater share of broadleaved species might deliver an increased level of TreMs compared to the currently prevailing coniferous forest types in the Black Forest. Moreover, the retention of large, old trees presents a disproportionally large contribution to the provisioning of TreMs. At the tree-level, similar attributes are driving factors for TreM abundance and richness as at the plot-level: DBH, species identity as well as altitude, slope or aspect. However, the most important result is that clumped retention of habitat trees does not increase abundance and richness of TreMs at the tree-level. Therefore, the selection of habitat trees should focus on individuals which currently provide the highest level of TreMs instead of clumped retention of trees which do not provide the highest richness or abundance of TreMs.

O6.5 - Examples of trade-offs and multiple ecosystem services assessment in the integrated management of maritime pine landscapes.

Christophe Orazio[1]

[1] European Forest Institute

Corresponding email: c.orazio.pro@laposte.net

Keywords: Planted forests

Maritime pine forest being installed planting improved tree material after ploughing to produce mainly wood for industries is often perceived as an industrial forest providing only wood. On the last decade many studies demonstrated that the system is much more integrated than it appears. In past studies, we set up indicators to link the deadwood remaining from the management activities to the biodiversity, the mushroom picking and other externalities have been estimated in a short study of 2010. In addition, INTEGRAL project offered the opportunity to analyse possible trajectories of many ecosystem services depending on the political choices done after the storm. A recent project SUSTFOREST+ is exploring the options to combine resin and wood production diversifying the production function. Following the recommendation from the SIMWOOD handbook, projects such as T4effect analyse ecosystem services consequences of increasing stump harvesting or TREFFOR looking at opportunities to intensify wood production using pines in more agricultural landscapes. On the top of this integrated management analysis, the question of landscape organisation for a better resilience to the main risks was discussed in a project promoting integrated risk management (FORRISK) and has been implemented in a just ending project PLURIFOR establishing risk management plans.

7. Managing forests in an era of change

2020-02-27
14:00 - 15:30

O7.1 - The effect of forestry treatments on forest site, biodiversity and regeneration: the Pilis Forestry Systems Experiment.

Péter Ódor[1]
Réka Aszalós[1], András Bidló[2], Gergely Boros[3], Péter Csépányi[4], Zoltán Elek[5], Csenge Veronika Horváth[6], Bence Kovács[1], Csaba Németh[1], Zoltán Soltész[1], Ferenc Samu[7], Vivien Sass[2], Flóra Tinya[1], Bence Tóth[8]

[1] Centre for Ecological Research, Institute of Ecology and Botany, Hungary
[2] University of Sopron, Institute of Environmental and Earth Sciences, Hungary
[3] Szent István University, Department of Zoology and Animal Ecology, Hungary
[4] Pilisi Parkerdő Ltd., Hungary
[5] MTA-ELTE-MTM Ecology Research Group, Hungary
[6] Eötvös Loránd University, Faculty of Science, Hungary
[7] Centre for Agricultural Research, Plant Protection Institute, Hungary
[8] Csik Ferenc Elementary and High School, Hungary

Corresponding email: odor.peter@okologia.mta.hu

Keywords: oak forests, forest management, microclimate, biodiversity, regeneration

The integration of conservation purposes into the management planning of production forests is crucial for ecologically sustainable forestry. For the implementation of these aims, exploring the effects of different management types on forest site, regeneration and biodiversity is necessary. Within the framework of a multi-taxa study, “Pilis Forestry Systems Experiment”, we studied the effects of different treatments of rotation forestry (clear-cutting, preparation cutting, retention tree group) and continuous cover forestry (gap-cutting) on these variables in a mature sessile oak – hornbeam forest.

Clear-cuts induced extreme microclimatic conditions with high daily temperature maxima and illumination. This habitat became detrimental for soil organisms (enchytraeid worms, crane flies). The understorey cover increased considerably, and was mainly characterized by non-forest species. In gaps, albeit the higher proportion of incoming light, humidity and temperature remained similar to the closed stand, while soil moisture was significantly amplified. It was favorable for soil organisms, just as for the plants. The understorey became denser, but it was still dominated by forest species. Regeneration was successful in clear-cuts and gaps as well; however, in both cases, shade tolerant species could outcompete oaks, and the colonization of oaks is limited in both treatments. Retention tree groups buffered the daily microclimatic extremes, but the mean values were similar to those in clear-cuts, and it was combined with dry soil conditions. This was detrimental for soil organisms, but the shaded conditions kept the original character of the understorey. The preparation cutting changed slightly compared to the original mature forest. The diversity and abundance of spiders and ground beetles were not influenced by the treatments, but their species and trait composition differed among the treatments.

Based on this five-year-old experiment, we can conclude that continuous cover forestry is ecologically more sustainable in this forest type than the shelterwood system, because low intensity interventions (gap-cutting, thinning) only slightly modify the microclimate and the communities of the studied

organism groups. Although treatments also create good conditions for regeneration, shade tolerant species should be controlled for a successful oak regeneration.

The study was supported by NKFIA K128443. Website: https://www.piliskiserlet.okologia.mta.hu/en.

O7.2 - Exploring the potential of a process-based forest growth model in supporting multifunctional forest management: the MULSTISILVA Decision Support Tool

Claudio Petucco[1]
Benedetto Rugani[1]

[1] Luxembourg Institute of Science and Technology, Environmental Research and Innovation Department, Luxembourg

Corresponding email: claudio.petucco@list.lu

Keywords: ecosystem services, decision support system, process-based model, multifunctional forestry

Ecosystem Services (ES) provision depends on the structure and evolution of forest ecosystems, which are eventually influenced by forest management. The increasing society's need for ES demands the rethinking of the management objectives and consequently the need to modify the traditional management practices towards a multifunctional forest management. However, enhancing the ES provision via the multifunctional forest management is rather challenging due to the complex structure of the problem, the large amount of required information and in some cases the lack of experience. These technical and information barriers can be overcame by providing managers and decision-makers with tools to quantitatively assess the present and future ecosystem services provision. This work focuses on the development of a decision support system (DSS) prototype, MULTISILVA, to support multifunctional forest management and assess alternative management practices. The DSS is based on a process-based forest model (3-PGmix Forest Growth Model) which has been calibrated for Luxembourg. Compared to state-of-the-art empirical forest models, process-based forest models have two main advantages: (i) they are suited to simulate new management paradigms since they explicitly consider the ecological structures and interactions in forests and (ii) they are able to describe carbon, water and nutrient cycles that are closely related to the provision of ecosystem services. Accordingly, we adapted and extended the original 3-PGmix model to accommodate a set of common management practices used to improve ecosystem services at the stand level (e.g., promotion of broadleaved species, uneven age structure, creation of set aside areas, increase the quantity of deadwood). By combining these practices, it is possible to define and simulate a set of management alternatives over a given time horizon and analyse their impacts on a set of ecosystem services indicators (e.g. timber provision, carbon sequestration, water infiltration, air purification, recreation). In addition, the DSS will be able to compute the direct costs as well as the opportunity cost for each alternative, with reference to pre-defined business as usual scenario. The functionalities of the DSS are illustrated simulating different management alternatives for a pine forest in Luxembourg.

O7.3 - Implementation status and suitability projection of climate change adaptation measures in European forestry; a policy and practice review

Johannes H.C. de Koning[1, 2]
Marcus Lindner[2]

[1] Copenhagen University, Denmark
[2] European Forest Institute, Germany

Corresponding email: jhc@ign.ku.dk

Keywords: climate change adaptation, forestry, Europe

Climate change is projected to have a large impact on the physiological functioning and biogeographical distribution of European forest ecosystems and the provision of forest ecosystem services. Many European policy makers and forest managers view forest management schemes such as close-to-nature silviculture and integrated forest management, which emulate natural processes for management purposes, as increasing the forest's adaptation to the changing climate conditions. The increasing awareness of the impending change is spurring policy makers, forest owners and foresters to develop and implement adaptation measures aimed at sustaining forest ecosystems under increasing pressure from continuous climatic change and increasing damages from extreme weather events and disturbances such as wildfires or insect pests. In this policy and practice review, we use survey results from national policy and forestry experts to identify the status of national policies for climate change adaptation for European countries. We assessed and categorised adaptation measures that are currently applied or developed for future use. Adaptation measures are categorised into targeting tree species composition, harvesting and regeneration methods, water retention, soil protection, forest management logistics, knowledge dissemination, policy development, research efforts, monitoring and public outreach. We assess the current implementation status of adaptation measures within the realms of intensified and integrated forest management and discuss their usefulness in light of the current climate change impact prognoses. Building on recent efforts to characterise forest management across Europe, we analyse how alternative integrated and segregative forest management regimes support or hinder climate change adaptation. Currently applied adaptation measures are expected to be insufficient to abate the negative impact that continuous climate change and correlated extreme weather events and disturbances are projected to have on European forests. New adaptive management approaches will need to be developed and applied specifically in regions that rely on natural regeneration of species with declining site suitability, challenging existing forest management paradigms such as close-to-nature silviculture and integrated forest management.

O7.4 - Future trajectories in fragmented forest landscapes: linking simulation modelling with the functional complex network approach

Marco Mina[1]
Núria Aquilué[1, 2], Matthew Duveneck[3], Marie-Joseè Fortin[4], Christian Messier[1, 5]

[1] Centre for Forest Research, Université du Québec à Montréal (UQAM)
[2] Forest Sciences Centre of Catalunya (CTFC)
[3] Harvard Forest, Harvard University
[4] Department of Ecology and Evolution, University of Toronto
[5] Université du Québec en Outaouais (UQO), Institut des sciences de la forêt tempérée (ISFORT)

Corresponding email: mina.marco@courrier.uqam.ca

Keywords: landscape modelling, management, disturbance, functional diversity, network analysis

Forests are projected to undergo dramatic compositional and structural shifts prompted by global changes, such as intensifying natural disturbance regimes, land use and climate change. This uncertainty makes planning for forest management exceptionally difficult and it demands for an integrated, dynamic landscape management approach to ensure that individual decisions are aligned in a territorial strategy aimed at maintaining the desire level and diversity of ecosystem services. This is particularly relevant in temperate biomes, where forests are often fragmented by intensive land use and where landscape connectivity is poor.

We applied a forest landscape model (LANDIS-II/PnET-Succession) to a large fragmented forested landscape in Southern Quebec to evaluate future landscape trajectories under global changes. The PnET ecophysiological succession model captures the changing drivers of local competition and integrate them in the LANDIS framework to account for landscape-scale spatial interactions and disturbances. We coupled this multi-scale approach with methods base on functional diversity and network theory to analyze the landscape as an interconnected spatial network of forest patches. This approach allows to determine where to intervene more efficiently in stands within the landscape to maximize the resilience of the forests to known and unknown disturbances at the minimum cost. Patches contributing the most to connectivity and requiring functional traits diversification are identified and targeted with management interventions. We simulated forest landscape dynamics over a 100 years period under multiple climate, disturbances and management scenarios, including one based on network properties. We assessed landscape resilience using indicators at multiple scales.

Our results show that climate change would not have large negative impacts on forest dynamics, but disturbances have the potential to strongly shape landscape patterns. Some tree species will likely decline while others may thrive under new climatic conditions. The network-based management approach performed best in maximizing resilience demonstrating that increasing both forest structural and functional diversity in centrally connected forest patches and enhancing landscape structural modularity by strategically adding patches can positively affect overall resilience to global changes in temperate fragmented forested landscapes. Our study demonstrates the value of upscaling forest management at the landscape level using the functional complex network approach.

8. Forest policies and their implementation

2020-02-27
14:00 - 15:30

O8.1 - Clash or concert in European forests? Integration and coherence of Forest Ecosystem Service related national policy

Karin Beland Lindahl[1]
Mireia Pecurul-Botines[2], Metodi Sotirov[3], Daria Tebenkova[4], Camilla Widmark[5]

[1] Unit of Political Science, Department of Business Administration, Technology and Social Sciences, Luleå University of Technology, Luleå, Sweden.
[2] Forest Science and Technology Centre of Catalonia, Crta. de St. Llorenç de Morunys a Port del Comte, km 2, 25280 Solsona, Spain.
[3] Chair of Forest and Environmental Policy, University of Freiburg, Freiburg, Germany
[4] Centre for Forest Ecology and Productivity of the Russian Academy of Sciences, 117997 Profsoyuznaya st. 84/32, Moscow, Russia.
[5] Dep. of Forest Economics, Swedish University of Agricultural Sciences, Umea, Sweden.

Corresponding email: karin.beland.lindahl@ltu.se

Keywords: Forest Ecosystem Services, Europe, policy integration, bio-economy, sustainability

European forests supply a range of Forest Ecosystem Services (FES), but are faced with competing demands. There are great aspirations to facilitate synergies between the provision of different FES within the framework of bio-economy and integrated forest management, but different interpretations exist as to how far the expected synergies range. Several studies suggest that integration of policy sectors and objectives have failed despite efforts to achieve co-ordination on EU and national levels, and more integration is called for. While policy integration is treated as a technical matter of design, it is a highly political process about the allocation of values and power. Ultimately integration comes down to what is integrated into what, and who is subordinating to whom. In a European forest context, policy integration is about what FES that future forests will supply. This study builds on previous research on policy integration and aims at exploring how the range of FES related policies are integrated at the national level in different European governance contexts, within and outside of the EU.

While the existence of goals conflicts, fragmentation and weak instruments to implement forest related policy are known problems in the EU, less is known about how this plays out on the national level. Existing research suggest that emergence of bio-economy strategies, climate and bioenergy policies, and their integration with forest policies, are driving a (re-)turn to economic timber production priorities. But a systematic analysis of how the range of relevant policy areas, objectives and implementation instruments, are integrated with each other on the national level is missing. This study addresses these knowledge gap by focusing on the national level and using cross country comparative case studies in Sweden, Germany, Spain and Russia. Our approach offers a systematic analysis of how climate-, energy-, and biodiversity policies are integrated with forest sector policy. We explore impacts on sustainability by applying theories about policy integration (PI) *and* environmental policy integration (EPI); and we address implementation by analyzing policy coherence. In contrast to existing EPI research, we analyze how *different* environmental policy objectives are integrated with each other and into forest sector policy.

O8.2 - Forestry policy approaches for integrated forest management in the United Kingdom

Susanne Raum[1]

[1] Imperial College London, Centre for Environmental Policy

Corresponding email: s.raum@imperial.ac.uk

Keywords: Forestry, policy, managemen, ecosystem services

A series of policy approaches have been proposed for the integrated management of the important forest resource. In the UK, two of the most dominant approaches have been multi-functional forestry and sustainable forest management. The Convention on Biological Diversity, amongst other transnational obligations, has added the ecosystem approach and the associated concept of ecosystem services to this succession. This latest addition raises the question of whether they constitute something fundamentally new and how they affect forest management. To answer these questions, a review of scholarly literature and documents and a survey of forestry stakeholders was undertaken. The analysis suggests, that in UK forestry the ecosystem approach and the ecosystem services concept are nothing fundamentally new, as the former is seen as being comparable to sustainable forest management, and the latter is understood as an extension of the idea of multi-functional forestry. However, it also suggests that in the UK, as elsewhere, the frequency of, often broad and ambiguous environmental policy approaches can be challenging for those involved in their implementation and practical application. In this study, stakeholders associated with forests in the UK were found 1) to frequently lack a real understanding of new policy concepts, especially during the early stages of a new introduction; 2) to conflate old and new concepts, with different levels of understanding in different communities; 3) to use the specific terminology of different concepts interchangeably, arguably layering new ideas on top of existing ones; 4) to consciously re-brand existing ideas because it better suits their goals and interests. 5) Stakeholders were also found to be weary or even dissillusioned about the frequency of policy innovations. This, however, may have a negative impact on their successful implementation and, ultimately, the sustainable management of our forest resource. A clear understanding of frequently overlapping, but fundamentally different approaches is therefore crucially important for successful policy implementation. There is also a pressing need for clear concepts and definitions and equally unambiguous principles for any policy approach in order to ensure that their implementation yield the intended effects.

O8.3 - What drives integrated forest management across the European continent? Experiences from practice and policy

Agata Konczal[1]
Jakob Derks[1], Johannes H.C. de Koning[1]

[1] European Forest Institute

Corresponding email: agata.konczal@efi.int

Keywords: integrative forest management, forestry, conservation, Europe, trade-offs

Integrated forest management (IFM) is a topical issue, but the definition of the concept can vary quite a bit. Even within a continent as small as Europe, different local cultures, climatic and geographic conditions and forestry traditions have led to very different applications of this concept. The project "Integrated Forest Management Learning Architecture" (INFORMAR) of the European Forest Institute (EFI) analyses existing knowledge relating to the implementation of IFM in order to address and fill potential knowledge gaps.

Twenty-eight selected practical cases, in nine European countries were studied in an attempt to understand and map out the current and future ecological, socio-political and economic driving forces of IFM in practice. The selected case studies cover different social environments, ownerships structures, sizes and bio-geographical regions. Moreover, in each country two national policy experts were interviewed, to gain understanding of not only the practcial impelementation of IFM but also the offical stance on it. Doing this, we attempted to establish an overview of how nature conservation and wood production can be integrated in the same stand under very different conditions and scales, and to get a grasp on the main common factors (social, technological, economic, ecological and political ones) that hamper or facilitate the promising approach that is IFM.

O8.4 - State forest conservation and management regimes in Ecuador: their governance and interrelations

Richard Fischer[1]
Paul Eguiguren[1, 2], Sven Günter[1, 2]

[1] Thünen Institute of International Forestry and Forest Economics, 21031 Hamburg, Germany
[2] Institute of Silviculture, Department of Ecology and Ecosystem Sciences, TUM School of Life Sciences Weihenstephan, Technische Universität München, 85354 Freising, Germany

Corresponding email: richard.fischer@thuenen.de

Keywords: deforestation, conservation, SFM, governance, Ecuador

Ecuadorian forests are among those with highest deforestation rates in South America with an annual forest loss rate of 0.6% calculated for the period 1990–2015. Native forests are reported to still cover 50% of the territorial land area. State programs related to management of native forests include, among others, nationally protected areas (SNAP) (4.9 mio ha) which include forests and foresee a prohibition of commercial timber use, the incentive based Socio Bosque forest conservation program (1.6 mio ha) which provides financial compensation for resignation from timber use and the Forest Administration System (SAF) granting timber licenses (on 53.000 ha in 2017). The existence of these programs indicates a segregated forest land use strategy. The study aims to elucidate the governance quality of the different programs on the ground as this is supposed to be linked to their effects on deforestation; it further explores possible interrelations between the programs on the ground. Results are based on data from the LaForeT project (www.la-foret.org) carried out in 12 landscapes in Amazon lowlands and the coast area. Inventory data are based on 72 plots from Amazonia. Participatory mapping exercises and focus group discussion for governance assessments were carried out in all landscapes. Results show that governance scores were highest for Socio Bosque and lowest for SNAP areas. Deforestation was very low in Socio Bosque and higher in SNAP areas in which there were partly conflicts with the indigenous population inhibiting effective conservation. First analysis of carbon pool reductions of up to 41% in harvested forests compared to old growth forests suggest that harvested and damaged volumes are at least partly above quantities that are commonly regarded as sustainable. However, intensity was lower in areas adjacent to Socio Bosque areas, which suggests that the presence of a conservation program in the area has effects on how logging is performed and which might be related to a greater presence of governmental representatives who are negotiating, monitoring and controlling the conservation areas. Governance principles of Socio Bosque areas might be regarded as a model also for other management types.

O8.5 - Enforcement: the missing link in integrated forest management approaches?

Andrew Haywood[1]
Yitagesu Tekle Tegegne[1]

[1] European Forest Institue, Sant Pau Art Nouveau Site, Sant Leopold Pavilion, St. Antoni M. Claret, 167 08025 Barcelona, Spain.

Corresponding email: andrew.haywood@efi.int

Keywords: Enforcement, FLEGT, VPA Forest Governance

A variety of integrated forest management (sustainable forest management, ecological sustainable development, multi-functional forestry, landscape approach) concepts have been developed to accommodate distinct social and ecological demands in different jurisdictions. Generally, these approaches are enshrined in national legislation. For the approach to 'work' in tropical countries it must not only be well legislated and designed but also efficiently and effectively enforced. There is a need to develop strategies as to how inspectors/auditors should go about the task of intervening in the affairs of organisations (both public and private) to ensure compliance and enforcement against any such integrated forest management framework — a question regarding which there is little consensus in the forest governance literature. To that end, a collaboration between governance researcher and practitioner at EFI aims to explore this question from several angles: descriptive; analytical and normative.

This study analyses the practices of a representative sample of VPA partner country* regulators (assumed to be 'best practice') to identify a number of distinctive enforcement strategies (which are only limitedly shaped by existing theoretical models). The work will explore:

- the advantages and disadvantages of each enforcement strategy and to consider how best to balance the often-competing criteria of effectiveness, efficiency and legitimacy; and
- how can resource allocation and intervention strategies be best integrated and whether there is a single 'best practice' enforcement strategy, and if not, what sorts of hybrids should be developed in jurisdictions wishing to learn and build on the lessons from VPA partner country regulators.
- how the analysis can inprove intergrated forest management approaches

* **VPA partner country is** any timber exporting country that enters into negotiations to conclude a Voluntary Partnership Agreement (VPA) with the European Union. **Voluntary Partnership Agreement (VPA):** A legally binding bilateral trade agreement between the EU and a timber-exporting country outside the EU. Each VPA aims to ensure that timber and timber products imported into the EU from a partner country comply with the laws of that country.

9. Ecosystem services: Innovation and Learning

2020-02-27
14:00 - 15:30

O9.1 - How do forest policy makers and practitioners learn? A survey related to belief stability and change on Forest Ecosystem Service in Germany and Spain

Laura Dieguez[1]
Metodi Sotirov[1]

[1] University of Freiburg

Corresponding email: laura.dieguez@ifp.uni-freiburg.de

Keywords: policy beliefs, policy learning, forest biodiversity, timber production

In this paper, we study the occurrence of, and mechanisms of policy learning, which is understood as changes in beliefs as result of the accumulation of new knowledge and experience. We draw on concepts borrowed from the Advocacy Coalition Framework, and Cultural Theory, to shed light on questions surrounding belief systems, and changes of beliefs regarding the synergies and trade-offs between forest ecosystem services (FES) in managed forests (with a focus on biodiversity and timber production). Specifically, this paper examines I) the current belief systems of policy makers and practitioners (with a focus on policy core beliefs), II) the changes and stability of such beliefs in the last 10 years in the light of external and internal shocks. To do so, an online survey targeting German and Spanish policy makers and practitioners was conducted. In total, 150 responses were received. The institutional profile and educational background account for the most significance differences in the respondent's belief systems. Regarding policy learning, the changes in beliefs differ according to the level of "exposure" of respondents in the last decade to I) natural shocks on forest (e.g. storms and plagues), II) changes in legislation (EU, and national level), and III) professional forums where exchange of knowledge and experience has taken place.

O9.2 - The role of social innovation for governing multiple forest ecosystem services

Gerhard Weiss[1, 2]
Alice Ludvig[1, 2], Ivana Zivojinovic[1, 2]

[1] European Forest Institute, Forest Policy Research Network, Vienna
[2] University of Natural Resources and Life Sciences, Vienna (BOKU)

Corresponding email: gerhard.weiss@boku.ac.at

Keywords: governance, policy, social values, civil society, Europe

Although forest policies often aim for a provision of a broad range of forest ecosystem services, timber production goals usually dominate in forest management, in most public and private forests. Other forest uses are often demanded by non-governmental organisations or public or civil society initiatives. While some initiatives for new forest ecosystem services are top-down policy initiatives (e.g. some biodiversity policies) or triggered by NGO's (e.g. recreational or sport uses of forests), there are also examples for civil society engagement which can be called social innovations. Social innovations are a major driver for advancing integrated forest management on both the policy-level and practical management. In this presentation, we ask to what extent and in which way social innovations contribute to a broader set of forest ecosystem services. For this purpose, we use a range of examples for forestry-related social innovations from across European countries, including various types of activities such as recreational uses (e.g. mountain biking), using forests for health, care or educational services (e.g. green care of social farming), inclusion of vulnerable groups, community forest stewardship, integrated rural development or forest fire fighting. We start from a definition of social innovation that gives the inclusion of civil society groups a central role in finding new solutions in the fulfilment of social needs. This understanding makes it distinct from traditional policy or market mechanisms and includes a broad range of goals of social well-being as indicated above. In the analysis, we apply a model of multiple mutual relations between social innovation and policy. Social innovations very often occur bottom-up but in that are by no means totally independent from policies since existing policy and institutional frameworks may be supportive and/or hindering. Furthermore, social innovations may have repercussions on the policy frame or even create specific targeted policies that aim to support social innovations in general (e.g. by supporting civil society inclusion in policy processes) or specific new social services of forests (e.g. green care, firefighting, etc.). Policies thus have roles in scaling up and scaling out social innovations.

O9.3 - Living lab organization and practices as useful tools to stimulate innovation in forestry practices

Maxence Arnould[1, 2]
Laure Morel[1], Meriem Fournier[2]

[1] University of Lorraine, ERPI (Equipe de Recherche sur les Processus Innovatifs), Nancy, 54000, France
[2] University of Lorraine, AgroParisTech, INRAE, UMR Silva, Nancy, 54000, France

Corresponding email: maxence.arnould@agroparistech.fr

Keywords: living lab, territory, innovation, co-design, stakeholders

Living labs are defined by the European Network of Living Labs (ENoLL) as user-led open innovation ecosystems, which engage all stakeholders in the form of a public-private partnership (PPPP) to co-create products, services, social innovations... in a real context. Over the last few years, they have been developed mainly around urban themes (e.g. Lorraine Smart Cities Living Lab LFLL, in France), digital technologies (e.g. Botnia Living lab in Sweden) and health (e.g. Care Innovation Center West-Brabant in the Netherlands). Forest management or policies as well as forest-wood chain sustainable development have always required a high level of cooperation between stakeholders - forest owners, wood industries, forest policies, local authorities and local inhabitants as recipients of a diversity of forest services as well as actors involved in forest care -, formalized into concepts as multifunctional forestry, community forestry, or forest-based bioeconomy. Nowadays, new forest-related challenges, as balance and conflicts between ecosystem services, climate change adaptation and mitigation, etc., stimulate not only participatory processes but also and mainly innovation, in order to find consensus between the different sustainability dimensions and to design adaptive and resilient forest systems in a rapidly changing world. Living lab vision and organization seem adapted to address such challenges through co-creating, user-centered and collective intelligence processes, multi-stakeholder and multi-challenges approaches, short-term and long-term visions and participatory actions. However, no living lab associated with territorial forest management has been formalized up to now. Within the framework of an ambitious territorial project (“Des Hommes et des Arbres”), we implement a living lab approach, supported by LFLL know-how. The first results are presented in a pioneer PhD project, specifically focused on the design of innovation systems to improve wood mobilization in small private forests while conciliating all ecosystem services. These results concern especially co-created practical tools (Swoted “PESTEL”, forest owners personas, etc.) useful for project facilitators. Living lab approach should complement or support existing schemes designed by French forest policies as “Plans de Développement de Massif” (Massif Development Plan), “Chartes Forestières de Territoires” (Territorial Forest Charters) or “Groupements d'Intérêt Economique et Environnemental Forestier” (Forest Economic and Environmental Interest Grouping).

O9.4 - A social-ecological-technical analysis framework for forest ecosystem services governance innovations

Carsten Mann[1, 2]
Stefan Sorge[1, 2]

[1] Eberswalde University for Sustainable Development
[2] Department of Forest Resource Economics

Corresponding email: carsten.mann@hnee.de

Keywords: governance innovations, forest ecosystem services, payment schemes, networks, InnoForESt

European forests provide a variety of ecosystem services. Due to the public goods character of many forest ecosystem services, the appearance of externalities, imperfect property rights and insufficient knowledge and information, markets often fail to efficiently allocate natural resources. Ensuring the sustainable provision of the range of forest ecosystem services requires new and unconventional approaches in forest management, business, and in the policies and interventions that govern these.
In this talk, we present the conceptual foundation and first empirical application of an analysis framework for explaining the emergence, development of spread of governance innovations for the provision of forest ecosystem services (FES). The framework builds on the idea of complex and interlinked social-ecological-technical-forestry-innovation systems in the context of the H2020 InnoForESt Innovation Action. Studying six governance innovations, among them payment schemes for ecosystem services (PES) and network approaches, the objective is to gain a solid understanding of what has influenced the governance innovations emergence and development, and what needs to be changed for innovation upgrading and/or upscaling. A wide range of stakeholders are included in the analysis following a multi-actor approach for knowledge co-creation.
Through the analysis, interdependencies are revealed, and adjustment possibilities of crucial influencing factors are conjointly elaborated for road mapping strategies, depending on the vision and ideas of participating actors. In addition, it is shown how the analysis results are integrated with other project findings elaborating on forestry innovation system conditions on EU level, down to local stakeholder visions and interactions. As an outlook, we highlight the need for a sound system-based and co-created information basis that allow for purposeful innovation conditioning.

Poster sessions

P1 The political and social science perspectives

2020-02-26
18:00 - 19:30

P1.1 - Innovative policy mechanisms for the delivery of multiple forest ecosystem services

Giorgia Bottaro[1]
Paola Gatto[1], Davide Pettenella[1]

[1] University of Padova

Corresponding email: giorgia.bottaro.2@phd.unipd.it

Keywords: Multiple Ecosystem Services, Innovation, policy Mechanism, Europe

Forest ecosystems deliver multiple goods and services, the supply of different forest ecosystem services (FES) is not isolated but they are interconnected, influencing and interacting among each other. This is fundamental to be considered in forest management. Indeed, forest management actions implemented for the enhancement of a certain FES can enhance the provision of another FES (*synergy*) or, on the contrary, can decrease the provision of other FES (*trade-off*). Understanding FES synergies and trade-offs is fundamental decision-making in forest landscape management. Moreover dealing with FES it is important to consider that this concept better highlights the relation between human well-being and ecosystems. This synergy has also to be inserted as a feature to be considered in decision-making processes.

In Europe, forests are one of the ecosystems that provide the highest level of ES but not always existing policy tools are able to properly support them. If markets and the traditional policy instruments fail to encourage ES supply, their availability remains below the social optimum. This is why it is important to define and test innovative mechanisms able to encourage forest owners in the provision of Forest Ecosystem Services.

The poster presents and analyses several European cases of implementation of innovative mechanisms to enhance the provision of a bundle of FES. The research was carried out within the H2020 project SINCERE that aims to support the provision of FES around Europe by aligning the policy framework that encourages this provision. The identification of the case studies was done through publicly available information and by consulting 18 experts of SINCERE network. The cases were analysed through a framework developed on purpose, based on the following dimensions: Identification of the case, Spatial and Time Scales, Targeted FES, Mechanism Description, Innovative features. The results highlight that existing mechanisms in Europe are often focused on the delivery of more than a FES at the same time, across different type of forest ecosystems and employing a wide range of mechanisms. They also cast light on the innovative features that characterise the most successful mechanisms.

P1.2 - Social innovation for increased resilience before forest ecosystem disservices: the example of Forest Defence Groups in Catalonia

Carmen Rodríguez Fernández-Blanco[1, 2, 3]
Elena Górriz-Mifsud[2], Irina Prokofieva[3], Constanza Parra Novoa[1], Bart Muys[1, 2]

[1] KU Leuven
[2] European Forest Institute
[3] Forest Science Centre of Catalonia

Corresponding email: carmen.rodriguez@efi.int

Keywords: social innovation, wildfire, civil society, resilience

Forests provide with multiple ecosystem services, but also disservices. Resilient communities are better prepared to co-exist with such disservices. By focusing in the case of wildfires, this paper takes on the case of the Catalan Forest Defence Groups (ADFs, in the Catalan acronym), and advances the understanding of how social innovation lead to the construction of more resilient communities. ADFs are local organizations that perform activities to fight and prevent wildfires across Catalonia (Spain). They were created by the Catalan government after the wildfire in the iconic Montserrat Mountain in 1986, and are formed by forest owners, volunteers and municipalities.
We analyse the ADFs to look deeper into the dual relationship that exists between the social and ecological dimensions. The main objective of this analysis is twofold. First, to identify the ecological and social factors enhancing and/or constraining the development of this social innovation, and second, to examine and evaluate how the outcomes of this bottom-linked social innovation affect the territory where they occur. Our research consists of a series of structured and semi-structured interviews, a focus group and content analysis of the main policy documents affecting the ADF's functioning. Results show that the trigger for the civil society to organize themselves and build these social networks of mutual help was the need to protect each other's properties in a context where firefighters were not prepared to combat wildfires. On the other hand, the trigger for the institutionalization of the ADFs in 1986 was the Montserrat wildfire. Results show that an important factor for the ADFs to survive successfully for over 30 years is the fact that the groups created by the Catalan government, were based on pre-existing social networks. They also show the geographical differences between these groups, as well as their potential to contribute to more resilient socio-ecological systems in the Mediterranean, where wildfires are increasingly becoming an important threat to society.

P1.3 - Strengthening governance foundations for sustainable forest management: from lessons to proposing a forest governance index

Yitagesu Tegegne[1]
FLEGT Facility na[1]

[1] European Forest Institute

Corresponding email: yitagesu.tekle@efi.int

Keywords: Sustainable forest management, Forest governance, indices, sustainable development

Improving the contributions of forest resources to the sustainable development of countries through enhanced provision of ecosystem services and reduced deforestation and forest degradation are fundamental elements to achieve targets set in the 2030 Agenda for Sustainable Development and the Paris Climate Agreement. This requires, among others, improvement in forest governance, which essentially entails a systematic process of identifying areas of weakness, devising and implementing suitable responses, monitoring results, continuing adaptation and learning to ensure progress. However, in-depth understanding about processes for and evidence of strengthening the governance foundations for assuring legality and sustainability of forest management (SFM)[1] is limited. Hence, global actors have been increasingly relying on existing indices[2] as data sources to signal progress toward meeting global targets or to assess country risk in timber supply chains[3]. These indices have several limitations describing governance status in forest sector over time. To that end, drawing both on in-depth literature review and on the analysis of experiences from governance reform processes in selected tropical countries triggered by international forest policies, this paper aims to: (i) describe and evaluate various governance indices; and (ii) explore how a facts-based index for documenting and monitoring improvement in aspects of forest governance – including participation of stakeholders, transparency, adoption of policies, and strengthening of enforcement and oversight of forest sector operations – is crucial for assuring legality and sustainability of forest management.

[1] SFM, according to internationally agreed language, is a dynamic and evolving concept that aims to maintain and enhance the economic, social and environmental value of all types of forests, for the benefit of future generations.

[2] Such as Transparency International's Corruption Perception Index, the World Bank's Worldwide Governance Index and Freedom House's Freedom in the World.

[3] E.g., NEPCon consults CPI and WGI to determine the risk of timber illegality. CPI is also used in FSC's 'risk-based approach'. Rule of law index, CPI, Fragile states index and Freedom in the world are used the WCMC country risk assessments. ITTO IMM in 2017 used generic indices to analyze the competitiveness of tropical forest-rich countries

P1.4 - Lost territory? A policy analysis of land abandonment in France and Spain

Theresa Frei[1]
Kim Edou[1], Georg Winkel[1]

[1] European Forest Institue

Corresponding email: theresa.frei@efi.int

Keywords: land abandonment, spontaneous forest establishment, governance analysis

Agricultural land abandonment in one of the major land use changes in Europe, representing a challenge for management in the region concerned. Drivers of land abandonment are related to socio-economic, ecological and demographic factors, which can be interrelated. Once land is abandoned, often spontaneous forest establishment (SFE) occurs, which has far-reaching ecological, economic, and societal consequences. Our research focuses on this land use change and analyses the governance of land abandonment in France and Spain, two countries with large areas of abandoned land. Particularly, the paper seeks to give an overview of the policy objectives and strategies on land abandonment by different actors in the field of agriculture, forestry and conservation in the two countries. By doing so, the paper also discusses potential conflicts and synergies related to SFE from the perspective of policy actors involved. The findings draw on empirical data from 25 expert interviews in France and Spain, which were analysed qualitatively. The preliminary results suggest that actors from agriculture, but also other from fields mainly see land abandonment from the viewpoint of agricultural loss and associated risks in these regions, addressing the need to tackle land abandonment. While there are no specific policy approaches to make use of new forest resources on abandoned land, forestry actors address these potentials through SFE. Regarding conservation, actors mainly aim to sustain agricultural practices and cultural landscapes. Up to now, approaches on how to make use of abandoned land for passive rewilding and restoration attempts remain on an academic level. While regional nuances exist, we can see in both countries that there is a lack of inter-sectorial exchange on the subject to address such a cross-cutting issue as land abandonment.

P1.5 - Innovations for securing Forest Ecosystem Service provision in Europe – A Review

Carolin Maier[1]
Carsten Mann[2], Monica Hernandez-Morcillo[2], Torsten Krause[3], Lasse Loft[4], Carol Grossmann[1]

[1] State Forest Research Institute Baden-Württemberg, Germany
[2] Eberswalde University for Sustainable Development, Germany
[3] Lund University, Sweden
[4] Leibnitz Centre for Agricultural Landscape Research, Germany

Corresponding email: carolin.maier@forst.bwl.de

Keywords: Forest ecosystem service provision, innovative governance, literature review

Forest ecosystems provide a range of provisioning, regulating, and cultural products and services that are essential to human well-being. Yet global environmental problems, increasing urbanization, industrialization pressures, and dominant market mechanisms put into jeopardy the long term sustainable provision of forest ecosystems services (FES). Generally speaking, markets favor private goods, such as timber, and are unable to provide financing mechanisms for public goods and services, such as carbon storage, biodiversity conservation or recreational value. Recently however, more and more entrepreneurs, policy-makers and scientists are working on innovative approaches to ensuring the future provision of diverse forest ecosystem services through unconventional approaches in forest management, business, and policies that govern these.

Given the diversity of forest types, context-specific importance of particular forest ecosystem services, and varying governance settings within Europe, innovations in forest ecosystem service governance are likely to be rather diverse. To systematize existing innovative efforts, we conduct a literature review of existing studies addressing innovation in forest ecosystem service governance in Europe.

P1.6 - Forests matter – medial representation of the recent challenges to German forests

Philipp Mack[1]
Eva Blaise[2]

[1] Albert-Ludwigs-Universität Freiburg
[2] Forstliche Versuchs- und Forschungsanstalt Baden-Württemberg (FVA)

Corresponding email: philipp.mack@confobi.uni-freiburg.de

Keywords: media analysis, forest management, drought, climate change

As the effects of recent droughts emerge, so does the public awareness of forests facing the challenge of climate change. In this context, discussions on adapted forest management and structures are intensifying. These discourses increasingly inscribe themselves in the trade-offs among the provision of multiple conflicting forest ecosystem services. This also happens through increasing attention of media reporting on forests in climate change. The media coverage reflects the negotiation processes between ecological, economical and social demands. Reconstructing the discourse of seemingly contradictory points of view thus also emphasizes the discursive power that can be attributed to media. Therefore, the aim of the contribution is to explore which actors and arguments are presented by the medial discourse, and how they position themselves in the public debate. Using a media analysis framed by global challenges such as climate change and biodiversity loss, and the resulting uncertainties for management, we will analyse how the actors, their interests and respective forest visions are being legitimized in a broad public opinion.

P1.7 - Instrument mixes for integrating old- and deadwood in managed forest: a sub-national comparisson across Switzerland, Germany and Austria

Hannes Cosyns[1]
Tobias Schulz[1], Georg Winkel[2], Gerhard Weiß[3]

[1] Swiss Federal Institute for Forest, Snow and Landscape Research WSL
[2] European Forest Institute, Bonn
[3] BOKU, Institute of Forest, Environmental and Natural Resource Policy

Corresponding email: hannes.cosyns@wsl.ch

Keywords: comparative policy analysis, integrated nature conservation, habitat trees, old-growth islands

In regions where wood production plays a prominent role, forest biodiversity targets are rarely met. A well-targeted policy mix is expected to steer the balance between wood production and nature conservation, and across Europe, a variety of policy instruments have been developed with the aim to integrate biodiversity goals into forest management. In our study, we compare seven states across Germany, Switzerland and Austria in which timber production and forest recreation are of a certain importance and thus potentially compete with forest biodiversity. We focus on the integration of old growth forest features (conceptualized as old-growth islands, grouped and single habitat trees, standing and lying deadwood) into the forest managed for commodity production. Our findings show that states' instrument mixes differ regarding type of instruments (e.g. legal securitization of surfaces and trees, compensation) and their spatial and temporal focus. Also, important differences can be identified with respect to how explicitly prescriptions for forest management are made or how clearly certain concepts (such as habitat trees) are defined. We further find differences regarding coordination of these policies across levels of government and between administrative sectors (forest and nature conservation), as well as regarding how implementation is organized. We will apply recent conceptual advancements regarding the comparative analysis of instrument mixes to expose strengths and weaknesses of the policies examined. We demonstrate that striking the balance between wood production and nature conservation requires implementing rules that foster the accumulation of strong deadwood in the productive forest without prescribing forest management practices in too much detail.

P1.8 - Forest ecosystem services frames in EU forest focused and related policies

Jerbelle Elomina[1, 2]

[1] BOKU
[2] EFI Forest Policy Research Network

Corresponding email: jerbelle.elomina@boku.ac.at

Keywords: Frame Analysis, FES multiplism, synergy and trade-offs

Forest Ecosystem services (FES) concept connected forest functions and processes to human wellbeing by making it central to human survival and consequently to the decision makers. Although it may seem that different sectors such as forest, climate, energy, bioeconomy, agriculture, water, research and biodiversity have a single notion regarding FES. All sectors promote their own objectives and initiatives under the FES concept resulting to multiplism or varying interpretations. It is the aim of this study to examine FES multiplism through the use of frame analysis on 35 EU forest focused and related policies. Using qualitative content analysis, atlas.ti software and expert interviews, results show that (1) FES is rarely mentioned in the policy documents and most policy document refer to forest and FES more indirectly; (2) forest policy documents are the lead documents framing FES; (3) there are seven main frames in the policy documents and the most dominant frame is *forest as provider of wood and non-wood forest products*. While the downplayed frame is *forests sustain socio-cultural wellbeing*. The frame *forest as contributor to bioeconomy* and *forest as climate change solution* legitimizes the production and harvest of wood; and (4) synergies and tradeoffs between the frames explicitly stated by the policy documents are ambiguous and inconsistent. This said, it is recommended that the results of this study be presented to decision makers to make them aware of the reconstructed frames and to show them as to what is emphasized and missing as the role of forests in the future is certainly expected to be an important one.

P2 The economic perspective

2020-02-26
18:00 - 19:30

P2.1 - Quantifying the marginal benefits of biodiversity-focused management in the Black Forest under environmental uncertainty

Nicole Still[1]

[1] University of Freiburg, Chair of Forestry Economics and Forest Planning & ConFoBi, Germany

Corresponding email: nicole.still@ife.uni-freiburg.de

Keywords: biodiversity, retention forestry, insurance value, modern portfolio theory

There has been an increasing precedent and pressure to better conserve biodiversity, as well as to account for increasing environmental risks and uncertainties (e.g. climate change, natural disturbances, pest outbreaks). Retention forestry has been identified as a key management approach to improve biodiversity conservation and promote resiliency in Central European forests. However, despite its prominence and application across multiple regions, there remains limited understanding of the economic ramifications of these practices. Previous work has explored the economic costs of retention forestry and corresponding optimization methods for particular biodiversity proxies, but little attention has been given to the quantification of the economic benefits under uncertainty and inclusive optimization for multiple proxies.

This research aims at quantifying the marginal benefits of retention forestry practices under increasing environmental uncertainty to inform forest management in the southern Black Forest, Germany. It builds from the hypotheses that a) orienting forest management towards biodiversity conservation has quantifiable economic implications and b) biodiversity targets can be achieved in a more economically efficient way. In the first stage, data from corresponding ConFoBi projects will be incorporated into coupled ecological and economic models to quantify the marginal benefits of retention practices for multiple biodiversity proxies (e.g. birds, insects, plant diversity). The marginal insurance value of retention practices to protect against the economic impacts of environmental risks on forest provisioning and regulating services (i.e. timber, carbon sequestration) will also be calculated. Using a process-based growth model to simulate service provision under multiple climate and environmental risk scenarios, more complete ecological-economic valuations of varying retention strategies under uncertainty will then be assessed. These valuations will finally be considered simultaneously using an adaptation of Modern Portfolio Theory (MPT) to optimize retention management practices for multiple biodiversity proxies across the study area's landscape.

This research will provide spatially explicit and economically efficient management recommendations to conserve biodiversity in the Black Forest, along with a useful framework for future biodiversity-related decision-making, forest planning and practice implementation. It furthermore explores novel applications of insurance valuation and MPT to a) optimize retention management practices under environmental uncertainty and b) simultaneously consider management for multiple biodiversity indicators.

P2.2 - Assessing the effectiveness, design and governance of Woodlands for Water Payments for Ecosystem Services schemes: outcomes of the PESFOR-W COST Action

Rik De Vreese[1]
Gregory Valatin[2], Thomas R Nisbet[2], Zuzana Sarvasova[3], Lars Högbom[3], Paula Gatto[4], Yiying Cao[5]

[1] Independent Researcher and Consultant in Ecosystem Services and Urban Forestry, Alice Holt Lodge, Farnham GU10 4LH, UK
[2] Forest Research, Alice Holt Lodge, Farnham GU10 4LH, UK
[3] Forestry Research Institute of Sweden – Skogforsk, Uppsala Science Park, 751 83 Uppsala, Sweden
[4] Department TESAF – Land, Environment, Agriculture and Forestry, University of Padova, Agripolis, Viale dell'Università, 16, 35020 Legnaro (PD), Italy
[5] RSK ADAS, Spring Lodge, 172 Chester Road, Helsby, Cheshire, WA6 0AR, UK

Corresponding email: rik.devreese+pesfor@gmail.com

Keywords: payments for ecosystem services, water quality, water framework directive, water purification

The PESFOR-W COST Action is a network of researchers and practitioners from 40 countries – from Europe and beyond – interested in the effectiveness of woodland measures in reducing agricultural diffuse pollution to watercourses, and the design and governance and cost-effectiveness of woodlands for water payments for ecosystem services (PES) schemes.

Diffuse pollution from agriculture is a significant pressure affecting over 40% of Europe's river and coastal water bodies. Accumulating evidence indicates that the EU Water Framework Directive's objective that each water body reaches "Good Ecological Status" by 2027 in many cases will only be achieved by targeted land use change. Small-scale forest planting ("Woodlands-for-water") is a potential solution to this problem.

To help underpin future development of woodlands for water projects, PESFOR-W is developing 'look-up' tables showing how key parameters influence the environmental effectiveness of woodland creation. An initial evidence review found, for example, 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.

PESFOR-W is developing a common protocol for assessing the cost-effectiveness of woodlands for water PES, creating a spatial repository of case studies, and will develop guidance on development of new schemes. It is exploring the potential for creating a Woodland Water Code along similar lines to the Woodland Carbon Code developed for the carbon benefits of woodland creation projects in the UK, and for linking with existing schemes covering other woodland benefits to help achieve wider goals of the carbon-water policy nexus.

P2.3 - Identifying successful mechanisms for the implementation of payments for ecosystem services in forest management

Harald Vacik[1]
Mona Nazari[1], Helga Pülzl[1]

[1] University of Natural Resources and Life Sciences, Vienna

Corresponding email: harald.vacik@boku.ac.at

Keywords: PES, forest economy, business model, forest ecosystem services

Expressing the value of ecosystem services in monetary units is an important tool to improve awareness and transmit the importance of forest management to maintain these services to environmental policy makers and other interested stakeholders. Different mechanism for Payments for Ecosystem Services (PES) have been progressively applied in both developed and developing countries. There are not sufficient investigations which compare PES experiences and lessons learned systematically. This study is embedded in the research project NOBEL ("Novel business models and mechanisms for the sustainable supply of and payment for forest ecosystem services"), which aims to develop strategies for the sustainable provision of PES. As a primary data source for this research, a database of successful PES case studies was compiled through reviewing the lessons learned. The information was synthesized according to specific case study characteristics including country of implementation, business model applied, ecosystem service provided, time period considered, scale of implementation, payment types, type of facilitator as well as demographic details on the buyer and sellers (gender, age, education, income), as well as cultural and political aspects. In-depth interviews were conducted with selected cases, to derive a detailed picture of the mechanisms of the projects and the motives. In this contribution we aim to present the key elements for a successful implementation of PES schemes. Based on that we will provide a better understanding of the opportunities that the PES mechanism offers in order to resolve environmental problems.

P2.4 - Climatic credits: a new tool to enhance forests' contribution to EU mitigation goals through multifunctional forest management

Teresa Baiges[1]
Teresa Cervera[1], Iñaki Gili[2], Cristina Vega[3], Pere Casals[4], Giorgio Matteucci[5]

[1] Centre de la Propietat Forestal (CPF)
[2] Oficina Catalana pel Canvi Climàtic (OCCC)
[3] University of Lleida (UdL)
[4] Forest Science and Technology Centre of Catalonia (CTFC)
[5] Consiglio Nazionalle delle Ricierce (CNR-ISAFOM)

Corresponding email: tbaiges@gencat.cat

Keywords: mitigation, water, biodiversity, carbon, PSE

In the last decade, coinciding with the first symptoms of saturation in the C-sink capacity of European forests, several projects have started to work in in the valuation of the mitigation capacity of those forest practices, which, beyond afforestation, can positively contribute to global C balances. Nonetheless, the lack of standard calculation methodologies and other governance problems have hindered the development of incentives for forest owners to apply them. Building from there, the LIFE project CLIMARK (2018-2023), proposes an innovative approach to incentive mitigation forestry in Mediterranean Europe: to promote multifunctional forest management, through the design of a local market of "Climatic credits". Climatic credits are devised from a holistic approach to forest management, aligned with the vision of the FAO concept of *Climate Smart Forestry* – which: i) applies solutions that capitalise adaptation mitigation synergies, and ii) takes into account the local characteristics of the territory to identify the most cost-effective management options. The development of the Climatic Credits is based in a set of adaptation/mitigation practices, for which their impact on 3 ecosystem services - climate regulation, water cycle regulation, and biodiversity – is valued and optimised. The development of the Climatic Credits will include transparent accounting rules, base-line standard values, list of forestry mitigation measures, buy-sell system and verification criteria. The design of the credits will be ready to be implemented in two pilot sites in 2021 in the regions of Catalonia (Spain) and Veneto (Italy). Their design involves a close collaboration between the two administrations in charge of forests and climate change in Catalonia.

P2.5 - Implementation and evaluation analyses of economic instruments for ensuring forest ecosystem services

Klára Báliková[1]
Zuzana Dobšinská[1], Jaroslav Šálka[1]

[1] Department of Economics and Management of Forestry, Faculty of Forestry, Technical University in Zvolen, T. G. Masaryka 24, SK-96001 Zvolen, Slovak Republic

Corresponding email: xbalikova@gmail.com

Keywords: economic policy instruments, payments for ecosystem services, policy analysis, governance

Forest policy in Slovakia has been trying to secure optimal provision of all forest ecosystem services for different population groups. Starting from this point, the aim of the paper is a complex evaluation of selected instruments using policy implementation and evaluation analysis. As a basis for the evaluation, we proposed a subset of criteria derived from relevant theories, which are: the theory of ecosystem services and payments for ecosystem services (PES), policy analysis and governance. The overall efficiency of the instruments is based on four main dimensions: type of the PES scheme; potential efficiency according to selected theories; quality of governance structures and implementation efficiency. The analysed economic instruments are: i) Land tax relief for owners of protected and special purpose forests; ii) Refunds on ownership rights restrictions due to nature protection/conservation; iii) Forestry support for non-provisioning ecosystem services; iiii) European subsidies. The methodological approach is based on social science research methods, with an emphasis on primary and secondary document analysis complemented by face to face interviews with relevant stakeholders. Land tax relief is implemented on the local level and is provided for forest owners on protective and special purpose forests. It could be considered as other economic instrument according to the PES schemes theory. Refunds on ownership rights from nature conservation legislation show some features of PES schemes and could be matched as PES-like schemes. This instrument is characterised by the needed cross-sectoral coordination between forestry and environmental sectors. Payments from the state budget for non-provisioning ecosystem services may be received by forest owners or managers for close-to-nature forestry with emphasis on more than provisioning forest ecosystem services. Environmental payments from Rural development program 2007-2013 are characterized by the highest complexity of governance and are the closest to the market concept of PES schemes. The results also show that the evaluated economic instruments are appropriate mechanisms for supporting forest ecosystem services in Slovakia.

P3 The silvicultural and conservation perspectives

2020-02-26
18:00 - 19:30

P3.1 - Promoting forest management integration or segregation? A multi-scale analysis of selected policy tools and initiatives in Italy

Mauro Masiero[1]
Laura Secco[1], Davide Pettenella[1], Elena Pisani[1], Paola Gatto[1]

[1] University of Padova - Department of Land, Environment, Agriculture and Forestry (LEAF) – Italy

Corresponding email: mauro.masiero@unipd.it

Keywords: Integrated forest management, Segregated forest management, Italy, Multi-scale, Policy

The Italian forest sector is facing significant changes and challenges. Changes have recently occurred in the policy, institutional and legislative framework (e.g. the function-shifting from the Forest Corp to the *Carabinieri* Military Police and the approval of the new National Framework Forest Law). Meanwhile expanding forest resources and territories/communities depending on them have suffered climate change-related challenges (e.g. fires, Vaia windstorm) and the reduced management of mountain areas. Within such a dynamic/critical context, rethinking and (re)activating forest management (FM) is recognised as a priority. However, different possible development paths are debated. Timber/biomass production remains important within the transition to a bioeconomy. Meanwhile initiatives aiming to value multiple ecosystem services (ES) have been launched and strong rewilding/conservation interests have emerged too. Such different positions reflect on dual FM approaches, i.e. integrated and segregated FM. Implications of these approaches shall be analysed in terms of policy tools and governance arrangements they imply as well as possible results/impacts.

The paper identifies relevant policy tools and initiatives in Italy and analyses them concerning their potential implications in terms of supporting integrated/segregated FM approaches. Three cases are analysed in depth, in order to cover a range of situations in terms of geographical scale (national/regional/local), promoters/actors (public/private) and approaches (multifunctional/specialised):

-The *National Forest Strategy*, being developed within the Ministry of Agriculture, Food and Forest Policies;
-The *Lowland Forest Association*, a public-private initiative operating across regions in Northern Italy and involved in the world-first application of the FSC ES Procedure for certifying a set of five ES; and
-The *Val di Sella* (Northern Italy), home of a permanent land-art exhibition and developing additional initiatives in the field of cultural ES.

The paper builds on a qualitative content analysis. By framing policy tools and initiatives, it aims to provide an up-to-date picture of possible directions/trends in future FM developments in Italy. By analysing three selected cases and their expected/on-going implications for the promotion of integrated or segregated FM, different factors, drivers and barriers are discussed. This two-steps analysis will contribute gaining a better understanding of Italian policies and tools and might contribute to inform future research and policy-making.

P3.2 - “It´s a matter of choice” -A seed zone approach for Central and West African timber species

Simon Jansen[1]
Olivier Hardy[1], Gilles Dauby[2], Kasso Daïnou[3], Jean-Louis Doucet[3]

[1] Evolutionary Biology and Ecology Unit, Faculté des Sciences, Université Libre de Bruxelles, Belgium
[2] Institute of Research and Development, AMAP Joint Research Group, Montpellier, France
[3] Gembloux Agro-bio Tech, Université de Liège, Gembloux, Belgium

Corresponding email: simon.jansen@posteo.de

Keywords: forest management, forest genetic resources, species distribution modelling, reforestation

Long-term resilience of forest ecosystems and forest regeneration are a major challenge to encounter climate change. However, the forests of West and Central Africa are facing serious anthropogenic threats. Illegal logging and unsustainable forest management cause e.g. species overexploitation, habitat fragmentation, and consequently the pauperism of biodiversity. Although most countries in Central Africa implemented forest management strategies aiming a sustainable use of their forest resources, regeneration rates of timber species are insufficient. Hence, aside from international voluntary initiatives (e.g. REDD+, FLEGT), national programmes were started particularly addressing the need for sustainable reforestation (e.g. Gabon [FFN], Republic of the Congo [UPARA]). However, inspections by local authorities attest insufficient efforts, methodical shortcomings, and thus low success rates in reforestations.

It is an essential assumption in plant ecology that the vegetation distribution, species composition, and species adaptation are strongly related to environment conditions. Tree species are not uniform biological entities, but evolved through natural selection to distinct intraspecific genetic ecotypes adapted to local environments. Sustainable reforestation must therefore consider the adequate choice of seed sources, which has to match the planting site conditions and contain sufficient genetic diversity to allow a population to adapt to future climate conditions. Seed harvest strategies have to ensure that the natural genetic diversity of a population is represented in the collected seeds, and that seed lots derive from definite homogeneous environmental areas. Both requirements are currently not realized in countries of the Guineo-Congolian forest complex.

Consequently, the recently launched project will provide a first spatial assignment of seed zones for key timber species of tropical Africa by integrating a comprehensive inventory of forest genetic resources (FGR) and geoecological data. The combination of species distribution modelling (SDM) with molecular data will present a novel methodical approach in forest seed zone delineation and currently the most accurate picture of intraspecific diversity of key timber species in tropical Africa. A first seed zone approach will provide (i) a basis for consistent monitoring and evaluation of sustainable management actions, (ii) guidance in choosing suitable seed sources, and (iii) key insights for the conservation of FGR.

P3.3 - The effectiveness of retaining habitat trees for provision of microhabitats and deadwood in temperate multiple-use forests of different age

Josef Großmann[1, 2]
Jürgen Bauhus[2]

[1] Forest Research Institute of Baden-Württemberg
[2] Chair of Silviculture, University of Freiburg

Corresponding email: josef.grossmann@forst.bwl.de

Keywords: retention, habitat tree, tree related microhabitat, deadwood

The cessation of forest management favors structural richness of forests. The provision of structural elements such as tree microhabitats and deadwood promoted biodiversity of forest dwelling species. Especially species which depend on old growth forest attributes benefit from this kind of structures. In Central Europe, integrative forest management approaches in multiple-use forests are meant to complement biodiversity conservation in forest reserves (core areas of national parks or biosphere reserves). This comprises retention of so called habitat trees or groups of habitat trees within managed forest stands.

The aim of our study was to test whether retention elements in older forest stands are richer in microhabitats and deadwood than the surrounding. And secondly how beech and fir dominated forest types differ in this regard.

In this study we investigated groups of habitat trees in beech and fir stands of different age classes in south-western Germany. Circular reference plots have been established in the forest surrounding the groups of habitat trees in order to be able to compare retention elements with the ‘average forest’. In all plots (habitat tree groups, reference plots) tree microhabitats and dead wood information (type, decay class, light availability) had been recorded amongst standard variables such as tree species, dbh, canopy class.

Following results are preliminary and still need to undergo detailed statistical analysis.

Overall tree microhabitat abundance and diversity was higher in habitat tree groups than in reference plots. This was also true for the microhabitat types: cavities, injuries and crown deadwood. Tree microhabitat abundance and diversity tended to be higher in older habitat tree groups in both forest types. Dead wood and coarse woody debris showed no trend or differences between age classes.

The results show that the selection of retention elements was successful as they are richer in microhabitats and deadwood compared to reference plots, especially for ecological important microhabitats as cavities and crown deadwood. However, we cannot say whether this is caused by initial selection of trees with more microhabitats than the average tree in the stands, or whether this difference is the difference of a higher accumulation of microhabitats since cessation on management.

P3.4 - Longevity of habitat trees and tree-related microhabitats in the Black Forest, Germany

Andreea Petronela Spînu[1, 2]
Jürgen Bauhus[1, 2]

[1] Chair of Silviculture, Albert-Ludwigs University of Freiburg, Germany
[2] ConFoBi (Conservation of Forest Biodiversity in Multiple-Use Landscapes of Central Europe) Research Training Group, Albert-Ludwigs University of Freiburg, Germany

Corresponding email: andreea.spinu@waldbau.uni-freiburg.de

Keywords: Forest structure, Forest biodiversity, Habitat trees, Retention Forestry, Tree Mortality

Tree-related microhabitats (TreMs) are specific morphological structures on standing trees that act as ecological niches for many forest-specialist species. Retention of large trees bearing TreMs (habitat trees) has been suggested as a successful practice to improve biodiversity in Central European forests. The longevity of both the habitat trees and their TreMs has not yet been studied in continuous-cover forestry, despite the critical importance of such information for assessing the long-term effects of this practice. Admixture of living and dead trees as supporting structures of TreMs is essential for fulfilling the structural complexity needed by dependent species.

To address this knowledge gap, this study utilizes repeated inventories of TreMs on the 15 largest living trees, considered potential habitat trees, in 80 one-hectare plots in the Black Forest region, Germany. The first inventory was carried out in 2016. Occurence of TreMs on dead trees will also be recorded in future inventories. Mortality rates will be calculated using aerial image interpretation and TreMs longevity will be predicted using survival analysis.

The study examines the following hypotheses:

- Habitat trees experience higher mortality rates because larger trees are more susceptible to environmental stressors and their vitality is decreased by occurrence of TreMs.
- Dispersed trees are expected to die faster than those in clumped distribution because their crowns are more exposed. Tree species and local conditions (altitude, climate) influence the mortality patterns.
- TreMs abundance and diversity is higher on dead trees.

This is the first attempt to investigate mortality of habitat trees and the first time-series of development of TreMs in Central European forests. Knowledge on TreMs longevity and their supporting structures will be essential for future management decisions, since trees of different dimensions, species, and anticipated longevity might be selected to provide continuity of TreMs over time.

P3.5 - Studying the response of avian inter-trophic relationships to multi-scale forest structure along a retention forestry gradient in southwest Germany

João Manuel Cordeiro Vale Pereira[1]
Ilse Storch[1], Grzegorz Mikusiński[2]

[1] Chair of Wildlife Ecology and Management, University of Freiburg, Tennenbacher Str. 4, D-79106 Freiburg, Germany
[2] Swedish University of Agricultural Sciences, Department of Ecology, Grimsö Wildlife Research Station, S-730 91 Riddarhyttan, Sweden

Corresponding email: joao.cordeiro.pereira@wildlife.uni-freiburg.de

Keywords: forest birds, retention forestry, forest management, forest specialists, trophic relationships

Retention forestry is a highly promising strategy for integrating forest biodiversity conservation into traditionally timber-focused management. Forest bird communities, which rely on the horizontal and vertical structural heterogeneity of their habitat, have much to gain from the retention of old-growth features. However, species' requirements are complex and often contradictory, calling for a more detailed and context-relevant evidence base from which management guidelines can be derived. Moreover, with organisms as mobile as birds, ecological processes act from single-tree to landscape scales in producing the patterns of diversity and abundance that we perceive. Inserted within the wider ConFoBi framework, and building up on three years of previous work analyzing numerical responses of birds along a retention gradient in SW Germany, this doctoral project sets out to understand the processes behind the patterns. Trophic links – both predation on birds and availability of food resources - are presumably one of the key mechanisms driving bird species' occupancy and abundance, and are hence defined as the main study target. During the spring months of 2020 to 2022, data will be gathered on bird species, their predators, and their prey across 135 ConFoBi study plots in the southern Black Forest, through bird point counts, a combination of invertebrate capture methods (pitfall trapping and blacklight trapping, among others), and camera-trapping, respectively. State-of-the-art statistical methods, such as N-mixture models and structural equation modeling, will be employed to disentagle if and how either changes in food availability or in predation intensity explain numerical responses of birds (diversity and abundance) to retention-driven modification of forest structure at multiple scales. Before the start of data collection, a comprehensive global review on the current knowledge about responses of birds' inter-trophic relationships to forest structure – with emphasis on retention forestry and similar systems – is being carried out and preliminary results are here presented as well. As retention practices spread across continents and silvicultural systems, a need arises for further evidence on biodiversity responses to forest structure and management in the context of Central European continuous-cover forestry. This study, along with other sister ConFoBi projects, answers precisely to that need.

P3.6 - Introducing the “Pilis Gap Experiment”: a new multi-taxa study focusing on the effects of continuous cover forestry

Bence Kovács[1]
Flóra Tinya[1], András Bidló[2], Gergely Boros[3], Péter Csépányi[4], Zoltán Elek[5], Csenge Veronika Horváth[6], Gábor Illés[7], Julia Locatelli[6], Csaba Németh[1], Zoltán Soltész[1], Ferenc Samu[8], Vivien Sass[2], Péter Ódor[1]

[1] Centre for Ecological Research, Institute of Ecology and Botany, Hungary
[2] University of Sopron, Faculty of Forestry, Institute of Environmental and Earth Sciences, Hungary
[3] Szent István University, Department of Zoology and Animal Ecology, Hungary
[4] Pilisi Parkerdő Ltd., Hungary
[5] MTA-ELTE-MTM Ecology Research Group, Hungary
[6] Eötvös Loránd University, Faculty of Science, Hungary
[7] National Agricultural Research and Innovation Centre, Forest Research Institute, Hungary
[8] Centre for Agricultural Research, Plant Protection Institute, Hungary

Corresponding email: kovacs.bence@okologia.mta.hu

Keywords: field experiment, continuous cover forestry, gap, oak forests, biodiversity

There is a paradigm shift in silviculture towards the not just economically but also ecologically sustainable continuous cover forestry (CCF) methods. Their aims are to provide timber, to maintain buffered microclimate and biodiversity, and to meet social requirements simultaneously. However, the concept and the details of these techniques has to deal with numerous uncertainties.

In broadleaved forests containing light-demanding tree species such as oaks, a widely applied tool of CCF is the creation of artificial gaps. Since these methods were originally developed in stands dominated by shade-tolerant species, there are no ultimate guidelines available that could help stakeholders to plan the harmonized managements in oak-dominated stands. Therefore, it is important to study from both a forest management and nature conservation point of view how the most important characteristics affect the gap environment *per se*, the biodiversity of these management-created habitats and the success of tree regeneration.

The “Pilis Gap Experiment” is conducted in a ~10 ha, 90-year-old sessile oak–hornbeam forest stand in Hungary. The area is fenced to exclude the effects of large-bodied game species. Five treatments with uncut control plots were applied in six blocks as replicates, within a complete block design in the winter of 2018/2019. The study follows a before-after control-impact design, thus, pre-treatment conditions were measured at closed canopy conditions with the same methodology.

Within the framework of the “Pilis Gap Experiment”, we focus on the effects of gap size (small: 150 m^2 versus large: 300 m^2), shape (circular vs. elongated) and type (promptly created vs. delayed extended). The applied and studied factors are already present in the Hungarian forest management practice, but these three effects have never been analyzed independently. The main questions of the experiment are: how will the implemented treatments change (1) the forest site conditions (microclimate, soil and litter properties); (2) the understory vegetation; (3) the natural regeneration; and

(4) the community structure of animal groups (enchytraeid worms, dipterans, ground beetles and spiders). (5) We detect the gap-closure and the structural changes in each treatment types as well.

The study was supported by NKFIA K128443. Further information is available at: https://www.piliskiserlet.okologia.mta.hu/en.

P3.7 - The effects of different silvicultural treatments on microclimate in oak-dominated forests: results of a 4-year experiment

Bence Kovács[1]
Flóra Tinya[1], Csaba Németh[1], Péter Ódor[1]

[1] Centre for Ecological Research, Institute of Ecology and Botany, Hungary

Corresponding email: kovacs.bence@okologia.mta.hu

Keywords: microclimate, oak forests, forest management, field experiment

Stable below-canopy microclimate of forests is essential for the biodiversity and ecosystem functionality. Forest management necessarily modifies the buffering capacity of woodlands, while rotation forestry often decreases that. However, the specific effects of different silvicultural treatments on microclimate, the temporal recovery after the interventions are still poorly understood.

The effects of four different forestry treatments (clear-cutting, retention tree group, preparation cutting and gap-cutting) on microclimatic variables were studied within a field experiment in a managed oak-dominated stand in Hungary, before (2014) and after (2015–2017) the interventions by complete block design with six replicates.

From the first post-treatment year, clear-cuts differed the most from the uncut control due to the increased irradiance and heat load. Means and variability of air and soil temperature increased, air became dryer along with higher soil moisture levels. Retention tree groups could effectively ameliorate the extreme temperatures but not the mean values. Preparation cutting induced slight changes from the original buffered and humid forest microclimate. Despite the substantially more incoming light, gap-cutting could keep the cool and humid air conditions and showed the highest increase in soil moisture after the interventions. For most microclimate variables, we could not observe any obvious trend within three years. Though soil temperature variability decreased with time in clear-cuts, while soil moisture difference continuously increased in gap- and clear-cuts. Based on multivariate analyses, the treatments separated significantly based mainly on the temperature maxima and variability.

We found that (1) microclimate changes immediately after the harvests; (2) the effect sizes among treatment types were consistent throughout the years; (3) the climatic recovery time for variables appears to be far more than three years and (4) the applied silvicultural methods diverged mainly among the temperature maxima.

Based on this study, the spatially heterogeneous and fine-scaled treatments of continuous cover forestry (gap-cutting, selection systems) are recommended. By applying these practices, the essential structural elements creating buffered microclimate could be more successfully maintained. Thus, forestry interventions could induce less pronounced alterations in environmental conditions for forest-dwelling organism groups.

The study was supported by NKFIA K128443. Details are available on our website: https://www.piliskiserlet.okologia.mta.hu/en.

P3.8 - Revisiting forest site type classifications – comparison of classification systems for European Boreal forests

Tähti Pohjanmies[1]
Nadezhda Genikova[2], Juha-Pekka Hotanen[1], Aleksandr Kryshen[2], Sergey Moshnikov[2], Jari Oksanen[3], Maija Salemaa[1], Elena Tikhonova[4], Päivi Merilä[1]

[1] Natural Resources Institute Finland
[2] Karelian Research Centre of the Russian Academy of Science
[3] Finnish Museum of Natural History
[4] Center for Forest Ecology and Productivity of the Russian Academy of Sciences

Corresponding email: tahti.pohjanmies@luke.fi

Keywords: boreal forest, vegetation, biodiversity, Cajander, Sukachev

Forest site type classifications are tools used in ecological and forestry research and forest management planning. Ideally, they provide information on the properties of a forest site independent of development stage and management history of the stand. In Finland, the Cajanderian forest site type classification is based on the composition of understory vegetation, with the assumption that it reflects in a predictable way the site's productive value. In Russia, the Sukachevian site type classification is similarly based on understory vegetation but also accounts for tree species. The two systems were developed in the European boreal zone but differ in terms of the exact rules by which site types are determined. Both of the systems are approximately one hundred years old, and the forests that they were created to describe have since been subjected to multiple anthropogenic pressures that are known to modify forest vegetation. At the same time, new demands placed on forests have given rise to new demands for the information provided by forest site type classifications. Recently emerged paradigms of forest ecology and natural resource management, such as the ecosystem approach and resilience thinking, emphasize the complexity, dynamism, and unpredictability of ecosystems. The applicability of vegetation-based forest site type classifications has thus been questioned. In this study, we create and employ classification models to classify forest sites into Cajanderian and Sukachevian site types based on vegetation composition. We then compare the Cajanderian and the Sukachevian systems in terms of i) the correspondence of community composition, and ii) the associations between site types and soil fertility, tree productivity, and ecological values. We show that within both systems site types are distinct and form meaningful gradients in terms of biodiversity, soil productivity, and tree growth. Certain site types from the two systems are largely overlapping with each other and associated with similar value ranges for variables describing site quality. These results aid in endeavors where Finnish and Russian forests are compared for the purposes of basic or applied ecological research. In addition, they show that site type classifications can still have clear utility in research, forestry planning, and conservation.

P3.9 - BOTTOMS-UP: Biodiversity Of Temperate forest Taxa to Orient Management Sustainability by Unifying Perspectives

Sabina Burrascano[1]
Peter Odor[2], Yoan Paillet[3], Rafael Barreto De Andrade[4], Inken Doerfler[5], Philippe Janssen[3], Asko Lõhmus[6], Joerg Mueller[7], Thomas Nagel[8], Juri Nascimbene[9], Johannes Penner[10], Liina Remm[6], Tommaso Sitzia[11], Ilse Storch[10], Flóra Tinya[2], Mariana Ujházyová[12]

[1] Sapienza University of Rome, Italy
[2] MTA Centre for Ecological Research, Hungary
[3] IRSTEA, France
[4] University of Maryland, USA
[5] Carl von Ossietzky Universität Oldenburg, Germany
[6] University of Tartu, Estonia
[7] University of Würzburg, Germany
[8] University of Ljubljana, Slovenia
[9] University of Bologna, Italy
[10] University of Freiburg, Germany
[11] Università degli Studi di Padova, Italy
[12] Technical University in Zvolen, Slovakia

Corresponding email: sabina.burrascano@uniroma1.it

Keywords: Multi-taxon, Conservation, Sustainability indicators, Forest Certification, Data platform

The maintenance of biodiversity is listed as the first issue in the definition of sustainable forest management, and is among one of the six criteria for assessing sustainability in the Pan-European region. Worryingly, indicators for this criterion derive from those traditionally collected for timber production assessment, and do not account for the diversity of organisms other than trees.

To understand the drivers of forest biodiversity and guide sustainable management, several taxonomic groups should be investigated. However, up to now, broad multi-taxonomic analyses were mainly performed through reviews and meta-analyses that may not soundly quantify the effects of management.

Recently, several research institutions took up the challenge of multi-taxonomic field sampling. These local efforts, however, have limited extrapolation power to infer trends at the European scale. It is high time to share, standardize and use existing multi-taxon data through a common platform to inform sound management and political decisions.

We present a new COST Action that will gather the most comprehensive knowledge of European multi-taxonomic forest biodiversity through the synergy of research groups that collected data locally. More than 2100 sampling units across about 300 sites will cover at least temperate and hemiboreal forest types. For each sampling unit, information will be available on three to eight taxonomic groups (vascular plants, fungi, lichens, birds and saproxylic beetles being the most represented) and on live stand structure and deadwood.

Multi-taxon biodiversity will be associated with: (i) information on forest management based on observational studies at the coarse scale, (ii) structural data deriving from forest manipulation experiments at the fine scale.

Specific objectives are:

- a standardized platform of multi-taxon data;
- a network of forest sites with baseline information for future monitoring;
- shared protocols for multi-taxon sampling;
- the relationships between multi-taxon biodiversity, structure and management;
- a coordinated network of forest manipulation experiments;
- indicators and thresholds of sustainability directly tested on biodiversity;
- management guidelines to be applied in forest certification and within protected areas.

The Action involves more than 60 researchers from more than 20 countries and represents an outstanding opportunity to develop a strong network of collaboration for standardized broad-scale multi-taxon studies in Europe.

Author Index