IUFRO Spotlight is an initiative of the International Union of Forest Research Organizations. Its aim is to introduce, in a timely fashion, significant findings in forest research from IUFRO officeholders and member organizations to a worldwide network of decision makers, policy makers and researchers. IUFRO will encapsulate, and distribute in plain language, brief, topical and policy-relevant highlights of those findings, along with information on where/how to access the full documents.

IUFRO Spotlight also aims to present activities such as sessions at major IUFRO congresses or the work of IUFRO Task Forces with a focus on emerging key issues that are of great interest to policy makers and groups inside and outside the forest sector, and contribute to international processes and activities. The **IUFRO Spotlight** findings will be distributed in a periodic series of emails as well as blog postings.

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A forest mix may best address global change

Managing a mixed forest in the context of environmental and social change is the focus of a recent publication put together by members of IUFRO Research Group 1.09.00 (Ecology and Management of Mixed Forests).

The structure, dynamics and functioning of such forests are increasingly relevant topics for researchers.

There are several reasons for this. According to the European Network on Mixed Forests (EuMIXFOR), mixed forests present more resistance to human and non-human disturbances; have higher biodiversity levels; have higher carbon storage capacity and thus higher potential for mitigation strategies; allow for better adaptation strategies for global change; and have higher productivity and support for ecosystem services.
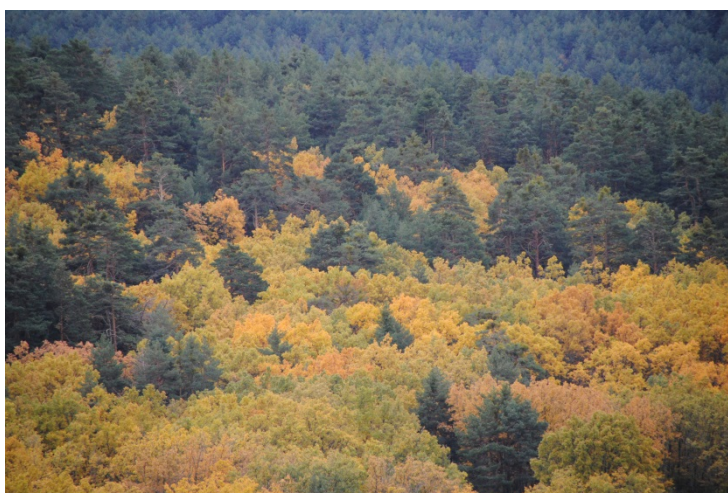
Mixed stand of Pinus sylvestris and Quercus pyrenaica in Matas Forest (Valsaín), Central Spain. Photo by Andrés Bravo-Oviedo

The new publication, which looks at the interplay among environmental drivers, social demands and forestry alternatives, is the final outcome of a European Cooperation in Science and Technology (COST) Action that funded EuMIXFOR, said Dr. Andrés Bravo-Oviedo, of the Department of Biogeography and Global Change, National Museum of Natural Sciences, Spanish National Research Council and one of the editors of *Dynamics, Silviculture and Management of Mixed Forests*.

"Even if we agree that mixed forests are the most resilient option to cope with changing conditions such as climate, we still know little about the response of mixtures," said Dr. Bravo-Oviedo, who is also coordinator of IUFRO RG 1.09.00. "Our publication gives some hints to help implement correct management of existing mixed forests and the creation of new ones."

Among the issues the publication delves into are:

- What species mixture is better adapted to current environmental conditions and social demands?
- What species composition would cope better with climate change?
- Are mixtures always more productive than monocultures?
- What are the drivers of stability in mixed stands?
- How do ecosystem processes and functions in mixed forests affect the delivery of ecosystem services?

For practitioners, the book offers different silvicultural methods, including regeneration and plantation designs for managing mixed-species forests. Students will be able to take advantage of recent research findings on forest dynamics, like growth and structure, and the public will be informed about the role of mixed forests in a changing world, he said.

Dr. Bravo-Oviedo noted that mixtures are complex systems whose behavior depends on species interactions that can be positive or negative depending on environmental conditions.

"Human systems and their changing demands on ecosystem services add more complexity to the picture. Decision makers must be aware that changes in any system can affect policy outcomes, and it is difficult for policy makers to make decisions when the outcomes are 'open' and uncertain," he said.

"Human societies," he went on to explain, "are requiring more services from forests – both commodities and amenities. Sometimes the demand is high for services that might have trade-offs, and the prevalence of one or another demand would depend on market availability and-or societal context (users' preferences)."

In terms of policy implications, Dr. Bravo-Oviedo said: "We presented an integrated framework of relationships between drivers of change and forest components under the umbrella of socio-ecological systems.

"Policy makers could use this framework to assess whether their decisions on mixed forests will affect negatively or positively either the ecological or the social system – or both.

"Building resilient forest systems in the context of Global Change requires increased tree species richness," he added.

"Policies encouraging the use of mixed forests can help in accomplishing international commitments like the Aichi Biodiversity Targets, (the 20 measureable, time-bound targets of the Strategic Plan for Biodiversity that should be met by 2020) the UN Sustainable Development Goals, the UN Global Forest Goals or Paris' Agreement.

"However," he went on, "it will take time to fully understand the dynamics of mixtures and the impacts of forest management on the delivery of ecosystem services from species-rich forests."

He explained that the publication gathers the knowledge and expertise from more than 200 EuMIXFOR participants and summarizes, among other things, the current practice of silviculture for mixed forests and the role of mixed-species plantations to increase resilience in Europe, Argentina and Chile.

"Researchers are doing their part to bridge knowledge gaps but the full understanding will require the participation of all stakeholders: policy makers, industry, forest managers and civil society," he said.

The publication can be found at: https://www.springer.com/la/book/9783319919522

About IUFRO Research Group 1.09.00 - Ecology and silviculture of mixed forests:
https://www.iufro.org/science/divisions/division-1/10000/10900/