Introduction to the Special Issue

In the 21st century, it is expected that the demands of society on renewable resources, particularly forests, will increase (Forest Europe, 2011). Forests provide not only wood but also many other ecosystem services as well, ranging from biodiversity conservation and carbon storage to various social functions, such that any form of management needs to consider all these different factors (Food and Agriculture Organization, 2006). Therefore, balancing increased requirements for wood with rising demands for ecosystem services will be one of the focal points of sustainable management of forests in the future (United Nations, 2007). There are three different approaches to managing this balance, the first is segregation or zoning, the second is integration or ‘multi-purpose’ forestry and lastly there is the combination of both. The first concept embraces an industrial approach to management, often exemplified by clearcutting in combination with forest reserves for ecological and social functions. In contrast, the integrative concept includes simultaneous use of forests for various goods and services. Uneven-aged silviculture in its broadest sense is the oldest existing example of the integrative use of forest resources in temperate and boreal forests (Schütz, 1999).

The use of uneven-aged forest management decreased in the second part of the 20th century due to rigid application, forest health problems, excessive deer browsing, difficulties of adapting forest operations and the lure of the industrial forestry alternative (Schütz, 2001; O’Hara, 2002; Axelsson and Angelstam, 2011; Boncina, 2011). The intrinsic complexity of uneven-aged silvicultural systems also caused difficulties with the verification of forest management overall performance (Laiho et al., 2011). Often uneven-aged silviculture was criticized for its loose connection with ecological processes, such as natural disturbance regimes. There are also many different applications and interpretations of uneven-aged forests and systems in various parts of the world. However, over the last few decades, there has been growing interest in uneven-aged silviculture and it has become increasingly important (Mizunaga et al., 2010). The main reasons for this include the increased significance of nature conservation, ecosystem services, forest resilience and stability in a changing climate, recreational functions and the fact that methods are being developed to quantify these values to aid the comparison with other approaches to forest management. In spite of many successful examples of uneven-aged silviculture, its ability to integrate ecological theory and natural processes with forest stability, climate change adaptation, technological feasibility and economic efficiency are still under debate.

Addressing these issues was the focal point of the conference ‘21st Century forestry: Integrating ecological, uneven-aged silviculture with increased demands for forests’. Uneven-aged forestry has a long tradition in south-eastern Europe and it was appropriate that the meeting was organized in Ljubljana, Slovenia, in September 2010. The conference was jointly organized by the International Union of Forest Research Organizations (IUFRO) research group on uneven-aged silviculture (group 1.05), the Department of Forestry at the Biotechnical Faculty, University in Ljubljana and the Slovenia Forest Service. This was the seventh conference of the research group since its formation in 1997.
at a meeting in Corvallis, USA; there have been subsequent meetings in Edinburgh, Scotland; Zurich, Switzerland; Espoo, Finland; Rouyn-Noranda, Canada; and Shizuoka, Japan. The objectives of the conference were to:

1. analyse the ecological, economic and technological limitations and advantages of uneven-aged silviculture,
2. compare long-term best practices of uneven-aged silviculture across different ecosystems and
3. clarify understanding of uneven-aged silviculture and discuss opportunities for its future application.

The meeting was attended by 92 participants from 27 countries. Six keynote presentations were given, as well as 48 papers and 16 posters. The meeting was organized in seven working sessions, which included old-growth forests as a reference for uneven-aged forest management, perspectives and theoretical background, regeneration ecology, modelling of uneven-aged forestry, ecophysiological research, case studies of uneven-aged forest management and economics and forestry operations. The wide variety of topics covered by the conference was indicative of the interdisciplinary nature of the IUFRO research group. An essential part of the conference were two field trips: one to traditional uneven-aged managed forests and family farms in the Slovenian Alps and another to the Dinaric region which covered both old-growth and uneven-aged managed forests in the region. After the conference, a Post-Conference tour visited a variety of forest types over a gradient from the Slovenian Alps to the Mediterranean region of the Adriatic coast, including Croatia. More information about the conference including abstracts of all the papers can be found on the Internet at http://web.fb.uni-lj.si/go/uafm2010/.

This Special Issue includes 11 papers presented at the conference. They cover various topics from forest ecology, silviculture to economics and case studies of uneven-aged forests from different geographic regions around the world. South-eastern Europe and the Balkans are known for their extensive forests; however, it is not widely recognized that these forests represent one of the origins of regulated uneven-aged forest management. Boncina (2011) reviews the history of forest management in the Dinaric region and describes the evolution from old-growth forests to selection silviculture and finally to freestyle silviculture. Freestyle silviculture combines aspects of different silvicultural systems at small spatial scales and thus allows flexibility in response to management objectives, variable site conditions and a changing climate. Work was also presented on current research on old-growth forest structure and dynamics. These forests are important reference points for understanding forest stand dynamics and a paper by Diaci et al. (2011) showed that in some countries anthropogenic influences on old-growth forests are much stronger than in others.

Gradual conversion is a silvicultural tool for achieving more natural and complex forest structures in the future (Kerr et al., 2010). In conifer plantations regeneration potential of broadleaves in the sub-canopy layer may substantially decrease the time and financial investment required for transformation (Schütz, 2002). A paper by Noguchi et al. (2011) explored these principles for plantations of hinoki cypress (Chamaecyparis obtusa) in south-western Japan. In these forests, the regeneration of broadleaved species is influenced by site conditions, stand structure and silvicultural treatment; where favourable, the regeneration offers considerable opportunities for the use of uneven-aged forest management. Designing optimal silvicultural treatments in terms of the spatiotemporal dynamic of gaps in hinoki cypress plantations may be substantially improved by modelling light climate and regeneration response in different cutting regimes as shown in the paper presented by Fujishima et al. (2011). Another modelling approach was described by Thurnher et al. (2011) who presented results of a study to develop and apply a harvesting model for uneven-aged stands dominated by Norway spruce (Picea Abies) in Austria. The outputs of the model were compared with long-term data from a forest area and the accuracy of the predictions was impressive and allowed examination of the development of forest structures over time. An innovative and well-received paper on modelling economic options to aid management decisions was presented by Roessiger et al. (2011). They simulated different management scenarios using a bioeconomic modelling approach that takes account of risk. The results show that if a manager wishes to minimize risks, then the optimal silvicultural strategy is to avoid both clearcutting and single-species forest stands.

Uneven-aged silviculture, especially single-tree selection forests are often associated with shade tolerant tree species. Guldin’s (2011) paper reviewed a successful long-term research area on shade intolerant pines in southern US. Despite this success and widespread use of uneven-aged silviculture in the past, the current use of even-aged pine stands is decreasing in the region. However, the paper makes the case that uneven-aged silviculture will gain in importance in the future because of the inherent resilience of uneven-aged forests: they can recover quickly from disturbance events and frequent establishment of new regeneration cohorts provide scope for adaptation to changing climatic conditions. Forests managed using uneven-aged management were also once widespread in northern European countries but there was a steep decline after World War II. However, four papers from this region included in this Special Issue reflect a renaissance of interest.

A paper by Laiho et al. (2011) reviews several field experiments compared even- versus uneven-aged forest management in Finnish boreal forests. The main findings were that there were no significant deficiencies of uneven-aged management in regard to regeneration, as well as growth and yield of stands and economics, while environmental and multifunctional aspects seem to favour this kind of management. Another paper from Finland by Pukkala et al. (2011) presents variable-density thinning as a tool for balancing economics, recreation and biodiversity maintenance in Norway spruce uneven-aged stands. They compared different cutting cycles and sizes of cutting segments in response to different management objectives such as profit maximization or the requirement for a continual presence...
of large trees. Beside optimization of forestry operations, the case for more widespread use of uneven-aged forestry requires greater acceptance, or perhaps a demand for it, by society. For this reason, the social studies presented in the Special Issue by Axelsson and Angelstam (2011) are significant. By interviewing local forestry stakeholders in Sweden, they were able to show that the majority have a negative view of uneven-aged forestry in terms of yield and economics, while ecological and sociocultural dimensions were perceived to be positive attributes. Another important contribution in this field is by Angelstam et al. (2011), who compared woodland history and the condition of different European landscapes to develop the concept of reference landscapes. This approach may aid social learning processes and help fuse ecological and social systems that are needed for improvement of future landscape governance.

We hope the papers in this Special Issue will find their audience so that they can aid further development of uneven-aged forest management and contribute to the sound future of the worlds’ forests. With this in mind, we would like to express our sincere appreciation to everyone involved with the production of this Special Issue: the authors and reviewers, Dr Lulu Stadler in the journal’s editorial office, staff at Oxford University Press and everyone who attended and supported the conference in Ljubljana, Slovenia, in September 2010.

References


