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PERSPECTIVES ON NEW DEVELOPMENTS OF DECISION SUPPORT SYSTEMS FOR SUSTAINABLE FOREST MANAGEMENT

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Abstract. This overview is an introduction to, and short discussions of, a selection of papers from the 2010 Workshop on Decision Support Systems in Sustainable Forest Management held in Lisbon, Portugal, on April 19-21, 2010. The papers from this workshop were selected as a result of collaboration between the conference organizers, its participants, and the editorial team of Mathematical and Computational Forestry & Natural-Resource Sciences. The collection of the articles that passed the peer-review process are presented in this Special Section on Decision Support Systems for Sustainable Forest Management, and are discussed by the Editorial Team that conducted the peer-review of this Special Section.

Keywords: Symposium Proceedings, DSFM, Systems Analysis, Operations Research

1 Background

The journal of Mathematical and Computational Forestry & Natural-Resource Sciences promotes research in both theoretical and computational studies that relate to extensive use of mathematics and computing, especially in ways that change the nature of the traditional uses of knowledge based on traditional methods (e.g., collection of data and significance analysis). Developments of complex simulation programs, which through computer simulations can reveal analytically intractable responses of complex systems to various actions, are at the core of this journal's interest. Decision support systems, computationally intensive simulation programs and other artificial intelligence-like developments, are seen by the editorial stuff of this journal as computational research similar in nature to theoretical mathematical studies. Thoughts and ideas about laws and dependencies, following an analytical path of logic leading to results based on rules and dependencies are encouraged. Furthermore, this journal also encourages reviews and discussions, especially by accomplished experts with extensive experience in areas relevant to mathematical and computational research. Such works are valuable and have potential to offer unique educational insight not available in other applied research publications.

This Special Section on Decision Support Tools for Sustainable Forest Management consists of four papers that illustrate the wide variety of operations research and mathematical sciences presentations made at the Workshop on Decision Support Systems in Sustainable Forest Management. Additional papers from this workshop are still in processing by this journal with intention of publishing them in the next issue of the Mathematical and Computational Forestry & Natural-Resource Sciences, in August 2011 (i.e., in MCFNS Issue 2 of Volume 3).

The Workshop Took place in Lisbon, Portugal, on April 19-21, 2010. It was held with the Sponsorship of the European Commission Funded COST Action FP0804 – ForSys. Its main purpose was to join researchers from different countries to exchange experiences for dealing with the complexities of decision making for forest ecosystem planning, and focus the discussion in the successful approaches for dealing with specific issues. The objectives of the workshop included discussion of what is important to end-users and stakeholders of planning processes and to understand the factors that may lead to successful implementation of these systems. The goals were not only to demonstrate how science is applied in decision-making processes, but also to discuss technological requirements for decision support tools and to assess applications of recently developed decision support systems.

Two main lines emerged as the focus of the manuscripts. The first line was Decision support systems

and tools for forest management planning, where some of the most innovative systems were described by the authors for distinct geographic situations. The second line on Models and methods to support forest management planning emphasized the methodological approaches for dealing with specific issues common in forest decision-making, from risk management to biodiversity assessment. In addition, reviews of the state-of-the-art of the technology in forest management decision support systems were welcome.

The DSFM 2010 workshop received 50 submissions from 20 countries, of which 15 were accepted for oral presentation. As experience exchange in different situations was the leading principle behind the workshop, about 16 submissions were selected for poster presentation. Over 75 attendees were expected to attend the workshop, which would make it a significant event in this scientific area. Yet, the Workshop was encumbered by the infamous Eyjafjallajökull eruption, the Icelandic volcano that clouded the European skies before, during and after the Workshop dates, making it impossible for many of the registrants to attend. For those who did attend from several parts of the globe and 3 continents, it was possible to share experiences, and was nevertheless a valuable and worthwhile event.

2 Contents of the Special Section

The four papers in this Special Section address three concerns (technological, personnel, and data) related to the implementation of planning systems within organizations. Of the four typical concerns for implementing systems in forestry organizations that were described by Bettinger (1999), only organizational commitment is avoided. One of the papers in this Special section represent advances in decision-support tool development. Feretti et al. (2011) describe a standardized decision-support system for addressing planning problems from the local to a national scale. One of the goals in the development of the system was to optimize the collection of data through innovative, bottom-up participatory processes. As Feretti et al. (2011) indicate, planning shares many common traits from one organization to another and across countries, however implementing a standardized process will require an examination of the legal commonalties among the entities involved. Some of the strengths of the system developed by Feretti et al. (2011) include the modularity of the process, the reduction in work effort, and the oversight provided during the data collection and management phases of the planning effort.

Along another line of inquiry, Van Orshoven et al. (2011) delve into geographic information systems (GIS) as a basis for decision support, and the processes that can be used to assist in the development of knowledge necessary for spatial forest planning problems. There are differences in how GIS is typically used in practice and how GIS could be used to facilitate spatial forest planning efforts. Van Orshoven et al. (2011) describe processes that could help GIS evolve further from a data management tool to a critical element of a decision-support system.

Lawrence and Stewart (2011) explore the link between computerized tools and forest management. Lawrence and Stewart (2011) suggest that there is a sufficient supply of technology available for assisting sustainable forest management within participatory systems, yet the usability of these tools by the broad range of participants may be the main issue why some are adopted and others are not. Four areas of concern are discussed: the design requirements (usability), a need assessment of the potential users, the integration of potential users into the development of the technology, and tests of the tools developed. Therefore, the focus of the discussion provided by Lawrence and Stewart (2011) is on the participants of collaborative forest management rather than the data or technology discussed by the other papers in this special section.

Based on his lengthy experience with fire planning and analysis in Canada, Martell (2011) provides a review of the decision-support systems that were developed over the last three decades, and the successes and perceived failures of the approaches. Martell (2011) provides a number of recommendations for operations researchers regarding the successful adoption of technology. As with Lawrence and Stewart (2011), many of these involve integrating the people who will use the technology into the design and testing phases of the developmental processes. In addition, Martell (2011) provides unique insight into the emerging challenges of fire-related decision-support, and the need to know and integrate ecosystem health concerns with fire management priorities. Stressing the need for both applied and basic research, Martell (2011) suggests that successful decision-support systems should provide good solutions for practical problems while being informed by basic research.

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