Introduction: Forest restoration in temperate and boreal zones

The past decade has witnessed an acceleration of forest restoration activities around the globe. Afforestation of former agricultural land, rehabilitation of natural forest processes and structures at the stand and landscape levels, and conversion of single-species plantations to mixed-species stands are among the prominent types of restoration practices currently being implemented throughout temperate and boreal forests. The impetuses for these forest restoration activities are diverse but restoration goals often include increasing the land-base of a particular forest ecosystem, increasing biodiversity, increasing ecosystem resilience and resistance, and increasing forest sustainability.

From 29 April to 3 May 2002, IUFRO, the Danish Forest and Landscape Research Institute, the US Forest Service and the Southern Swedish Forest Research Centre organized and hosted the 'International Conference on Restoration of Boreal and Temperate Forests – Documenting Forest Restoration Knowledge and Practices in Boreal and Temperate Ecosystems'. Researchers and managers from four continents and 19 countries attended the conference held near Vejle, Denmark, where they were able to study general restoration approaches, identify regional differences and discover common challenges for restoring forest ecosystems. Conference sessions focused on (1) the concept of forest restoration; (2) forest restoration practices (including afforestation, reclamation, vegetation conversions, natural and artificial regeneration techniques); (3) restoration material; (4) restoration effects at stand and landscape levels on biodiversity, wildlife, aquatic systems and land-use; (5) understanding processes and changes in process levels during forest restoration; and (6) economic and political impacts of forest restoration. The Danish Centre for Forest, Landscape and Planning published proceedings of the conference, which provided extended abstracts of 110 presentations delivered at the conference (Gardiner and Breland, 2002). This special journal issue presents a selection of full-length papers that highlight a diversity of timely forest restoration topics from across the boreal and temperate zones.

The 14 papers presented in this issue encompass a broad view of forest restoration. Included in the issue are original reports on recent scientific achievements, synthesis papers based on previous comprehensive work on specific restoration topics, and case studies of relevance to forest restoration practitioners. Eight of the papers focus on forest restoration questions in conifer ecosystems, five focus on forest restoration questions in broadleaf forest ecosystems, and one addresses conversion of conifer-dominated forest types to broadleaf forest ecosystems. Scientific approaches, designed to define restoration reference states, are described by authors working in the Swedish Boreal Region and the Rocky Mountain Region of the western United States. Incorporation of active management to restore and maintain forest biodiversity is addressed for ecosystems of the Pacific North-west Region and the Lower Mississippi Alluvial Valley of the United States. Stand processes that influence choice of forest restoration activities and success are examined in the Ore Mountains of Germany and the Rocky Mountains. Authors working in the Mediterranean Region, the Baltic Region and the Lower Mississippi Alluvial Valley provide investigations on seedling quality, species selections and other afforestation practices. Political, sociological and economic aspects of forest restoration decisions and practices are addressed within the context of conifer ecosystems of the South-eastern United States.

As this collection shows, forest restoration is a complex task that challenges existing knowledge of forest ecosystems. What to do? How to do it? Who should pay? These are obvious questions that are

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surprisingly difficult to answer to the satisfaction of all groups holding a stake in the outcome. Restoration generally implies a return to some more natural, pre-existing state but the attempts to identify reference states illustrate the difficulty of objectively defining the desired condition in credible terms. As the papers on stand processes show, both degradation and restoration occur within the framework of stand development and successful restoration is a process that may require multiple interventions. Forest ecosystem restoration is in its infancy and the work in the temperate and boreal zones, exemplified by reports in this special issue, raises more questions than it answers. Yet some conclusions can be reached: forest ecosystem restoration is a widespread challenge, complicated by diverse ecological and social conditions, subject to the desires of multiple interest groups, and requiring active intervention with on-going management. It is our hope that this collection of forest restoration knowledge and experience will advance this field and ultimately contribute to scientifically sound practices that ensure forest ecosystem health and sustainability throughout the boreal and temperate zones.

Reference

Gardiner, E.S. and Breland, L.J. 2002 Proceedings of the IUFRO Conference on Restoration of Boreal and Temperate Forests – Documenting Forest Restoration Knowledge and Practices in Boreal and Temperate Ecosystems. *Danish Centre for Forest, Landscape and Planning Report* No. 11, 238 pp.

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