

Forests on the edge: forest ecology in rapidly changing conditions¹

This special issue of the *Canadian Journal of Forest Research* highlights research presented at the 12th North American Forest Ecology Workshop (NAFEW), which took place in Flagstaff, Arizona, USA, in June 2019. NAFEW is a biennial workshop series designed with the explicit mission “to bring researchers, academicians, and managers together to foster dialogue and discussion of current issues related to basic and applied research in forested ecosystems in North America”. NAFEW 2019 was a truly continental conference. Over 300 attendees from Canada, Mexico, and the United States gathered to discuss exciting new discoveries, identify pressing management applications, and recognize emerging contemporary issues.

Forests in North America, and indeed around the world, are experiencing rapid shifts in structure, function, and human valuation. In the context of these rapid changes, NAFEW 2019 provided a venue for researchers and forest managers to come together and explore effective and responsive forest management strategies. The NAFEW 2019 conference theme, “Forests on the edge: forest ecology in rapidly changing conditions”, reflected a focus on understanding the dynamic nature of 21st century forest ecosystems. The papers included in this special issue, like the presentations and workshops at NAFEW 2019, encompass a wide variety of research investigating important contemporary forest ecology topics.

In developing the program for NAFEW 2019, we incorporated the conference theme into special sessions and workshops focused on identifying key issues related to our rapidly changing ecosystems and working toward solutions to those challenges. These are reflected in this special issue, in which Sáenz-Romero et al. (2020) bring together a series of presentations from a special session on climate change in Mexican temperate forests into a paper summarizing the many challenges facing the temperate forests of Mexico while also presenting solutions. The theme was also represented during in-conference field trips, for example, to the Southwest Experimental Garden Array, a set of 10 common garden sites designed to study the effect of climate change on plant species.

Our three keynote speakers addressed different aspects related to our theme, including the “spin” that media sometimes include when reporting on science and changing systems (Constance Millar), a global perspective on the uncertain future of old and historical forests (Craig Allen), and an applied view of adapting forest management to our changing world (Brian Palik). These keynote addresses set the stage for each day of the workshop and ongoing discussions related to the theme.

To highlight the workshop nature of NAFEW, we solicited workshops in the call for session proposals, and Klaus Puettmann subsequently held a hands-on training workshop on accommodating uncertainty in silviculture using scenario analysis. Co-organizers John Bradford and Kristen Waring hosted a panel discussion on

the long-term outlook of forests in the Southwestern United States, given the rapidly changing climate in this region. Six panelists from Arizona and New Mexico contributed to a lively discussion that highlighted what we know, what we wish we knew, and how to approach finding solutions that will maintain forest cover in the 21st century. Uncertainty and the willingness to take risks were frequently mentioned.

We opened this special issue to all presentations at the conference, from which the reviewers selected 11 papers from across North America. In an invited synthesis that grew out of an organized session on forest health challenges and climate change in Mexican forest ecosystems, Sáenz-Romero et al. (2020) review approaches, including assisted migration of entire forest communities, to conserve biodiversity in this hyperdiverse region. In a conceptual paper, Lieffers et al. (2020) review western Canadian reforestation practices to illustrate the value of flexibility and acknowledging risks to forest planning from natural disturbances. Boucher et al. (2020) develop a tool for planners to address unplanned disturbances such as predicting wood borer infestation in postfire jack pine (*Pinus banksiana* Lamb.) to help prioritize salvage. From the human dimension aspect of forest ecology, Gordon et al. (2020) discuss public attitudes towards longleaf pine (*Pinus palustris* Mill.) restoration, as well as factors contributing to those attitudes, to enable better communication between managers and the public.

Several papers illustrate the enduring strengths of long-term forest silvicultural experiments for addressing contemporary challenges. Kolb et al. (2020) apply a long-term stocking study to investigate controls on ponderosa pine (*Pinus ponderosa* Douglas ex P. Lawson & C. Lawson) seedling survival following a regional natural regeneration event. Using the Date Creek variable retention harvesting experiment in British Columbia, Farnell et al. (2020) evaluate the effectiveness of variable retention harvesting in augmenting coarse woody debris pools and habitat for American marten (*Martes americana* (Turton, 1806)). Using the same long-term experiment, Coates et al. (2020) examine how retention treatments interact with tree species to influence windthrow vulnerability.

Global change, a core workshop theme, is reflected in several papers in this special issue. Dixit and Kolb (2020) use a greenhouse experiment to compare growth, drought resistance, and cold tolerance among southwestern ponderosa pine provenances. Filicetti and Nielsen (2020) investigate barriers to regenerating linear oil sands seismic survey gaps in Alberta and provide an example of how to prioritize reforestation across similar anthropogenic disturbances worldwide. Two papers from a contributed climate change session use a shared common garden experiment: Bucholz et al. (2020) comprehensively investigate drought tolerance and growth strategies in southwestern white pine (*Pinus strobiformis* Engelm.), and Garms et al. (2020) demonstrate the potential of unmanned aircraft systems for low-cost monitoring of seedling performance.

¹This is the introduction to a collection of papers presented at the 12th North American Forest Ecology Workshop (NAFEW), held in Flagstaff, Arizona, USA, 23–27 June 2019. The NAFEW series of workshops brings together researchers from Canada, the United States, and Mexico to share information and insights every 2 years.

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Taken together, the papers highlighted in this special issue represent the breadth and diversity of scholarship for which NAFEW has become known.

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