Whole-Community or Whole-Ecosystem Approaches to the Assessment, Maintenance and Restoration of Biodiversity

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A species-by-species approach continues to dominate the conservation agenda. More wholistic approaches to biodiversity conservation are challenging to implement because there are so many variables to consider, because communities and ecosystems are continuously changing, and because the processes and rules underlying community or ecosystem assembly and stability are poorly understood. Despite these difficulties, progress is being made on both theoretical and applied fronts. We draw on examples from our research in eastern and western Canadian boreal forests to illustrate concepts of community and ecosystem integrity, to summarize some recent refinements in coarse-filter strategies for biodiversity conservation, and to discuss priorities for future research. Stand-scale to regional-scale examples of black spruce–sphagnum ecosystems and southern mixedwood ecosystems dominated by trembling aspen and white spruce are presented a) to show how range-of-variability concepts can been used to identify and monitor biotic elements and ecosystem processes at risk from current management practices; b) to assess the success of natural disturbance-based silvicultural systems in conserving biodiversity; and c) to evaluate the potential for ecosystem restoration through intensive silvicultural intervention. Future research will focus on the processes that underlie community stability or integrity and on developing models that predict cumulative responses of plant communities and ecosystems to changing climate and human land use.