

# Quantifying Uncertainties Associated with Estimates of Greenhouse Gas Emissions and Removals From Canada's Managed Forests

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**Abstract:** Canada is developing the National Forest Carbon Monitoring Accounting and Reporting System (NFCMARS) to meet international reporting obligations under the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol. The system integrates information about forest area, age and species composition, growth rates, and natural and anthropogenic disturbances in a modeling framework that simulates the forest carbon cycle at stand and landscape scales. The system reports, at regional and national scales, the emissions and removals of greenhouse gases in Canada's managed forests. Approaches to quantify the uncertainties associated with these estimates are being developed. The difficulties associated with meaningfully quantifying uncertainty for national-scale estimates of greenhouse gas emissions and removals from Canada's forests arise from the wide range of input data sources that are combined in the analysis and the degree to which statistical uncertainties can be defined for these data. The parameterization of ecological processes is typically based on studies that are localized and with known error structure. Uncertainties are introduced when scaling up or outside of the domain within which these parameters were developed. Other input data - such as forest inventories compiled for operational and planning purposes - cover larger spatial scales. Information characterizing the uncertainties associated with these data, however, is often anecdotal or based on expert judgment. We present and discuss a framework that we use to assess the appropriate spatial and temporal scales at which to evaluate the effect of specific sources of uncertainties on the overall estimates of greenhouse gas emissions and removals.

**Keywords:** Carbon cycle, Carbon accounting, NFCMARS, Uncertainty analysis, Canada's forests.