A Robust Model for Protecting Road-Building and Harvest-Scheduling Decisions from Timber Estimate Errors

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Abstract:

Road-building and harvest-scheduling decisions are primarily based on timber estimates and forecasts that are known to contain errors. It has been shown that in the presence of constraints, decisions generated under these conditions are likely to become infeasible. Therefore, solutions are required that can ensure constraint fulfillment despite the estimation errors. We present a robust model formulation of a multiperiod road-building and harvest-scheduling problem in which protection against minimum demand infeasibility is sought despite the existence of timber estimates that are defined as continuous ranges of values instead of point estimates (as is usually the case in this type of problems). We compare the benefits of this robust formulation with those of the traditional deterministic option and explore the tradeoff between the robustness of the solutions and its impact on the objective function. By simulating different scenarios of the timber coefficient realizations, it is shown that the robust approach produces solutions that are less sensitive to errors in the timber estimates at the expense of a slight reduction in the objective function.

Keywords: Forest planning; Road building; Robust optimization; Timber estimate errors; Uncertainty