Discussion

Road network designs in wood supply analysis

(Walker, H.D. and W.H. Lougheed)

by Robert A. Douglas¹

The authors are to be commended for tackling a complex problem and producing what appears to be a tractable solution. Further practical application will indicate how useful the model is.

In the paper, the authors have built up a compound model from various existing submodels, creating the necessary linkages between submodels. The intent is to link roading alternatives to harvest planning, thus bringing in the effect on harvest planning of a parameter not previously examined in great detail. They have ample justification for attempting the model: it has been estimated that transportation costs represent roughly one-third of the cost of wood arriving at the mill gate (Edwards 1983). Further, it is self evident that roading alternatives will heavily influence trucking costs. The new twist that the authors have placed on this is to mesh these relationships with harvesting options.

The paper highlights an additional problem, however. In the paper, as well as in most literature addressing the subject, there is confusion between route *location* and route *selection*. The two are not the same.

Route location is a "clean slate" problem. One starts with a completely unroaded area, and attempts to find the optimum layout of main and secondary roads. On the other hand, in route *selection*, one starts with an *existing* road network, and looks for the best pathways through this existing network.

There are many network analysis routines available, some linked to GIS applications, that handle the route *selection* problem. Obviously the solutions they are capable of giving are only as good as the original route *location*. The results are often paradoxically that the best selections of pathways are through the worst laid out networks.

The literature — and this paper — gloss over the very large problem of where the roads should be located in the first place. Building up an intricate compound model to relate road and harvesting parameters is very useful, but attention should now be focussed on the foundations of that compound model. Founding such optimizing models on "seat of the pants" route location is inconsistent.

The paper indicates that Network 1 is taken from company records. However, there is no indication as to how that network was originally laid out. Further, Network 2 is "contrived". On what basis?

Models exist for the optimum *location* of both main forest roads (Douglas and Henderson, 1988) and secondary roads (Nieuwenhuis, 1987). Work should be carried out now to integrate these models with the kind of model the authors have assembled, resulting in a more even, consistent approach to the problem.

Once the road networks are loaded into the model, the authors examine arc travel times, given average haul speeds. These haul speeds are based on road classification. Again, however, one is faced with the prospect of running a sophisticated model using fairly crude data.

Forest road classifications are typically fairly broad: a company might typically have only two or three classes of roads. It must be remembered that the specifications for these classes are the *limits* for road characteristics: they represent the *envelope* for the road structural and geometric attributes. A road may be built to a higher standard on local stretches, but still be given a low classification. On the other hand, road classifications tend to be treated rather loosely. It is not unusual to find that the specifications have not been adhered to over relatively long stretches. Often, the biggest deviation from road standards is the overriding of the maximum allowable gradient and this can be the greatest contributor to increased trucking costs through greatly increased fuel consumption.

The real costs of operating vehicles on forest roads can be extremely variable, along individual stretches of a single road, and between various roads deemed to fall within a given road classification. Calculating hauling costs from average haul speeds linked to road classification can be very misleading, yet this is the foundation for the model the authors have presented.

Models are being developed to ultimately predict instantaneous vehicle operating costs, through continuously updated fuel consumption calculations based on the power demands placed on the vehicle as it travels along the road (McCormack, 1985, Provencher and Douglas, 1989, Douglas et al. 1990). These should eventually be incorporated into the kind of model the authors have presented.

In summary, the work of Walker and Lougheed has taken forest practitioners a long way toward the full integration of transportation and harvesting considerations. The next aspects in need of improvement, however, are the optimum layout of forest road networks themselves together with the more faithful modelling of vehicle operating costs on specific road alignments, and how these can be integrated into the kind of model the authors have presented.

References

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