# DISCUSSION / DISCUSSION

# Comment on "Estimating canopy fuel characteristics in five conifer stands in the western United States using tree and stand measurements"[1]

## Miguel G. Cruz, Martin E. Alexander, and Ronald H. Wakimoto

**Abstract:** Reinhardt et al. (E. Reinhardt, J. Scott, K. Gray, and R. Keane, Can. J. For. Res. **36**: 2803–2814, 2006) questioned the validity of the regression equations for estimating canopy base heights in coniferous forest fuel types developed by Cruz et al. (M.G. Cruz, M.E. Alexander, and R.H. Wakimoto, Int. J. Wildland Fire, **12**: 39–50, 2003) to produce logical results when applied to simulations involving low thinning. This turns out to be an error in interpretation with regard to the stand height input parameter.

**Résumé :** Reinhardt et al. (E. Reinhardt, J. Scott, K. Gray et R. Keane, Rev. can. rech. for. **36** : 2803–2814, 2006) ont mis en doute la validité des équations de régression servant à estimer la hauteur de la base du couvert dans les types de combustibles associés aux forêts de conifères, développées par Cruz et al. (M.G. Cruz, M.E. Alexander et R.H. Wakimoto, Int. J. Wildland Fire, **12** : 39–50, 2003), quant à leur capacité à fournir des résultats logiques lorsqu'elles sont utilisées dans des simulations impliquant une éclaircie par le bas. Il s'agit en fait d'une erreur d'interprétation concernant le paramètre d'entrée pour la hauteur du peuplement.

[Traduit par la Rédaction]

Reinhardt et al. (2006) describe a detailed study of canopy fuel stratum characteristics in five western US conifer stands. The purpose of this communication is to specifically address a criticism levied by Reinhardt et al. (2006) that the empirical relationships developed by Cruz et al. (2003) "predict that thinning (i.e., reducing basal area) will decrease canopy base height, an illogical result."

Cruz et al. (2003) developed regression equations for estimating canopy base height (CBH) and other canopy fuel stratum characteristics for use in assessing crown fire potential in four broad conifer forest fuel types found in western North America. The CBH regression equations employ stand height and basal area as independent variables. Reinhardt et al. (2006) reached their conclusion about the validity of the Cruz et al. (2003) regression equations to properly simulate the effects of thinning on CBH based on the positive sign of the coefficients in these equations. They acknowledged that this was indeed appropriate for stand basal area but in the case of stand height would lead to illogical behavior.

Reinhardt et al. (2006) appear to have misunderstood that the Cruz et al. (2003) CBH regressions treat stand height as a predictive variable and that this input is based on the average of all trees, not just the dominant or top height. The application of "low thinning" (thinning from below) in a forest stand principally involves the removal of suppressed and intermediate stems (Smith 1962). These trees generally have the smallest diameter-at-breast-height and shortest stem height in a stand, which in turn generally have the lowest CBH. Therefore, by progressively thinning or removing the smallest trees from the stand, this effectively leads to an increase in stand height and, coupled with the decrease in stand basal area, results in a considerable increase in the CBH.

## References

Cruz, M.G., Alexander, M.E., and Wakimoto, R.H. 2003. Assessing canopy fuel stratum characteristics in crown fire prone fuel types of western North America. Int. J. Wildland Fire, **12**(1): 39–50. doi:10.1071/WF02024.

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Reinhardt, E., Scott, J., Gray, K., and Keane, R. 2006. Estimating canopy fuel characteristics in five conifer stands in the western United States using tree and stand measurements. Can. J. For. Res. **36**(11): 2803–2814. doi:10.1139/X06-157.

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