April 12, 2023

Email: ombud@cbc.ca

Dear CBC Ombudsperson,

We are scientists who conduct research in the field of mycorrhizal ecology. We have reviewed claims in the video 'What are trees saying to each other about climate change? | Planet Wonder Ep. 1' [https://www.youtube.com/watch?v=J1iuOOkZm54] and found that some are inaccurate and misleading. As such, we request that CBC removes this video. Not only is this documentary promulgating misinformation, but it also erodes the credibility of science. For a more in-depth analysis of these claims, please see our recently published, peer-reviewed journal article (attached to this email):

Karst, J., Jones, M. D., & Hoeksema, J. D. (2023). Positive citation bias and overinterpreted results lead to misinformation on common mycorrhizal networks in forests. *Nature Ecology & Evolution*, 1-11.

At the start of the video, it is described how roots of trees can be physically connected by mycorrhizal fungi. In ecology, this is known as a common mycorrhizal network (CMN). We focus our review on claims about CMNs in forests, our research expertise.

Claim 1: Trees talk to each other through common mycorrhizal networks.

We broadly interpreted 'talking' to include resource or signal transfer among trees in a forest. In our recent analysis (Karst et al. 2023), we found that there was no conclusive evidence that CMNs transfer resources between trees and/or tree seedlings. Similarly, we found no evidence from peer-reviewed, published studies in forests that trees send warning signals to each other through CMNs. The single peer-reviewed, published study that has examined signalling among tree species through CMNs was an experiment in a greenhouse; however, any signalling was cancelled when root interactions were allowed between neighbouring seedlings, as they typically would in any natural situation where CMNs would form. Moreover, greenhouse studies necessarily use seedlings, not adult trees. Mature trees are not large seedlings, and forests may have emergent properties; thus, it is not appropriate to extrapolate outcomes from greenhouse experiments to a forest.

In our review, we also examined graduate student theses pertinent to this topic. Results from graduate student theses either do not support or contradict the claim. There appears to be only one study evaluating carbon transfer from relatively old, living trees (125–275 years old) to conspecific seedlings, but it does not control for the soil pathway. In other words, in this latter study, it is not possible to determine the role of CMNs in resource transfer from old trees to seedlings.

The above referenced graduate student theses are:

Gorzelak, M. A. 2017. Kin-Selected Signal Transfer Through Mycorrhizal Networks in Douglas-Fir. PhD thesis, Univ. British Columbia

Asay, A. K. 2013. Mycorrhizal Facilitation of Kin Recognition in Interior Douglas-Fir (*Pseudotsuga menziesii* var. *glauca*). MSc thesis, Univ. British Columbia

Orrego, G. 2018. Western Hemlock Regeneration on Coarse Woody Debris is Facilitated by Linkage into a Mycorrhizal Network in an Old-Growth Forest. MSc thesis, Univ. British Columbia.

Claim 2: Old trees recognize their kin seedlings through common mycorrhizal networks.

There are no studies in the peer-reviewed published literature testing this claim. The single test of this claim (from a graduate student thesis, yet to be peer-reviewed and published) reported results that contradict this claim. In the graduate thesis written by A. Asay, unrelated (non-kin) seedlings had higher survival than related seedlings when grown next to old trees. Access to CMNs did not influence this effect, i.e., CMNs played no role in seedling survival.

Asay, A. K. 2013. Mycorrhizal Facilitation of Kin Recognition in Interior Douglas-Fir (*Pseudotsuga menziesii* var. *glauca*). MSc thesis, Univ. British Columbia

Claim 3: Old trees direct resources flowing through common mycorrhizal networks to favor kin seedlings.

There are no studies in the peer-reviewed published literature testing this claim in forests. In the single peer-reviewed greenhouse study testing kin effects, carbon was transferred through the soil solution, not a CMN. Preferential carbon transfer to kin seedlings occurred in two of four families tested; in no case were CMNs involved. A similar result was reported in a non-peer-reviewed greenhouse study done by a graduate student.

Pickles, B. J. et al. 2017. Transfer of 13C between paired Douglas-fir seedlings reveals plant kinship effects and uptake of exudates by ectomycorrhizas. New Phytologist 214, 400–411

Gorzelak, M. A. 2017. Kin-Selected Signal Transfer Through Mycorrhizal Networks in Douglas-Fir. PhD thesis, Univ. British Columbia

Claim 4: Trees in forests are warning each other of stress through common mycorrhizal networks.

As we mention above, the single peer-reviewed, published study that has examined signalling among tree species through CMNs in response to stress—in this case, insect damage—was an experiment in a greenhouse. We describe the problems with this study and its extrapolation under Claim 1.

Given the inaccurate and misleading claims presented in this video, we believe it would be prudent of the CBC to remove it. Thank you for considering our request.

Sincerely,

Justine Karst, Associate Professor, University of Alberta

Jason Hoeksema, Professor, University of Mississippi