Alternative NI-PDF curve settings for sensitivity analysis

The NI-PDF curve was built using meta-analysis results based on global data [1] including only few data from boreal forests and for which pressure level or stage of development definitions raises questions about the proper data to be used for the curve setting. Consequently, alternative correspondence values were tested as sensitivity analysis for the ecosystem quality evaluation aspect. Although we recognize that PDF values are too uncertain to be used, the analysis on the means highlights the sensitivity of the PDF values when included into the LCA model.

The effect of the NI-PDF curve set up on the related impact score was analyzed by applying alternative PDF values for the different portions of the curve corresponding to the naturalness classes. Alternative settings are detailed in Tables S1; S1a shows the provisional curve and the other letters correspond to alternative NI-PDF points of correspondence tested. Alternative curves tested are illustrated in Figure S1.

Table S1a. Hypothesis and data source of the provisional (a) curve.

NI	PDF	Hypothesis and data source
0.1	0.394	Plantation intense use [1]
0.2	0.192	Plantation minimal use [1]
0.3	0.1	Curve smoothing
0.4	0.038	20% Young; 50% Intermediate; 30% Mature; light/intense secondary forests [1]
0.5	0.001	Curve smoothing
0.6	0.00001	theoretical low losses related to the low probabilities of species losses
0.7	0.0000001	Theoretical very low losses related to the very low probabilities of species losses
≥0.8	0	No losses

Table S1b. Alternative hypothesis and data source of the (b) curve.

NI	PDF	Hypothesis and data source
0.2	0.25	50/70 Plantation minimal use; 20/70 Plantation intensive use [1]; one fourth of the forest species dependent of dead wood [2,3]
0.3	0.12	Curve smoothing

Table S1c. Alternative hypothesis and data source of the (c) curve.

NI	PDF	Hypothesis and data source
0.5	0.01	Curve smoothing

Table S1d. Alternative hypothesis and data source of the (d) curve.

NI	PDF	Hypothesis and data source
0.4	0.049	30% Young; 40% Intermediate; 30% Mature; light/intense secondary forests [1]
0.5	0.01	Curve smoothing

Table S1e. Alternative hypothesis and data source of the (e) curve.

NI	PDF	Hypothesis and data source
0.3	0.12	Curve smoothing
0.4	0.0724	20% Young; 50% Intermediate; 30% Mature; minimal secondary forests [1]
0.5	0.03	Curve smoothing

Table S1f. Alternative hypothesis and data source of the (f) curve.

NI	PDF	Hypothesis and data source

0.6	0	No losses
0.7	0	No losses

With the provisional curve (Figure S1a), the resulting ranking of the silvicultural scenarios based on the impact score (IS) was consistent with the scientific knowledge related to forest management showing the following impact ranking: *PL only* > *Current mix* > *CL only* and an impact decreasing with the level in strict protection. Figure 5b shows the impact score (IS) results if the lower limit of the altered class would have been instead set based on a proportion of one fourth of the forest species dependent of dead wood [2,3]. Using Newbold's richness data for minimally used plantations over 50/70 (i.e. the proportion of plantations over 20 years old) of the planted area and data for intensively used plantations over 20/70 of the area, would lead to a PDF of 0.25 and the PDF at NI = 0.3 adjusted to 0.12 to smooth the curve (Figure S1b). By increasing the range of the data, this setting would have amplified the difference between the impact scores for PL and CL in the low levels of protection (up to 30% of protection, as the NI reach 0.4 at 35% of protection). Therefore, if the species losses would be higher in the altered class (PDF up to 25% instead of 19.2% with the provisional curve), the impact score would allow a better discrimination between silvicultural scenarios at low levels of protection as indicated by the wider spacing between the IS curves (Figure 5b). If the PDF in the middle of the semi-natural class would have been set to an higher level (0.01 instead of 0.001) (Figure S1c), this would have put the CL results curve closer to the *Current Mix* curve. It raises CL curve between 0 and 40% of protection, and the PL curve between 35 and 55% of protection (Figure 5c). The points related to protection levels allowing to avoid important losses are still at the same level of 25, 35 and 50% for *CL only*, *Current Mix* and *PL only* respectively, but the levels preventing any losses would correspond to 40, 50 and 60% respectively. The Figure 5d shows the results if the middle of the semi-natural class would have been set to 0.01 instead of 0.001, and the lower limit of the semi-natural class would have been set to 0.05 instead of 0.04. This setting considers a slower recovery of vegetation after clearcut by applying an alternative proportion by development stages (i.e. 30% of young, 40% of intermediary and 30% of mature lightly and intensively used secondary forests from Newbold et al 2015 [1]). The resulting impact score would be greater for *CL only* than for the *Current Mix* at low levels of protection, despite a higher naturalness (or a lower alteration) for the *CL only* scenario for every level of protection (Figure 5d). The points where losses start lowering are still for 25, 35 and 50% in protection for *CL only*, *Current Mix* and *PL only* respectively, but an objective of avoiding losses would use 40, 50 and 60% in protection for *CL only*, *Current Mix* and *PL only* respectively. Figure S1e shows the curve if it would have been set using higher potential species losses for the lower bound of the semi-natural class. This setting uses data for minimally used secondary forests with the initial spreading over the development stages (i.e. 20% of young, 50% of intermediary and 30% of mature), and applying PDF = 0.3 for NI = 0.5 and PDF = 0.12 for NI = 0.3. This produces a curve shape closer to the linear pattern for the data scope. The resulting impact scores would indicate a higher impact of *CL only* up to 20% of protection, and an impact of the *Current Mix* equivalent to the one of *PL only* (Figure 5e). Finally, the figure 5f shows the results if no species loss would be associated with the near-natural class. This would not have a noticeable effect on the outcome.

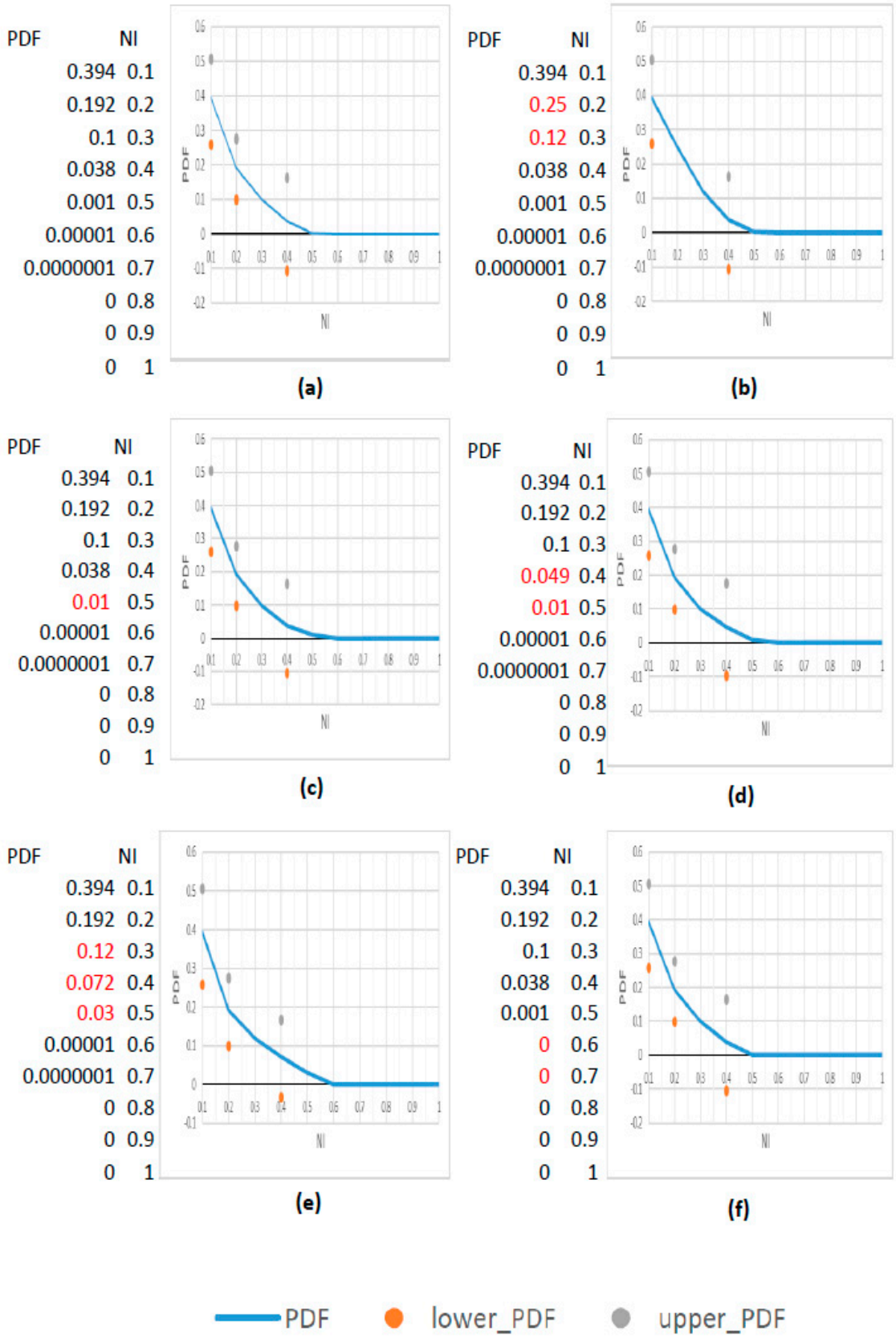

Figure S1. Alternative NI-PDF curves tested for sensitivity analysis, with alternative data used for curve estimation indicated in red ; lower and upper PDF: confidence interval limits (when available) (**a**) Provisional curve; (**b**) Test of an alternative setting for the altered class; (**c**) Test of an alternative setting for the middle of the semi-natural class; (**d**) Test of an alternative setting for the whole semi-natural class; (**e**) Test of an alternative setting considering higher losses for the data range; (**f**) test of no species losses for the near-natural class.

References

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