Appendix S1. Responses to Hagmann et al. (2018) critiques about Tables 1-3.

Yes, as Hagmann et al. (2018) said, some of Baker and Hanson's (2017) initial comparisons were not closely matching, as they were not made at the same spatial scales or did not overlap, but published comparisons made by Hagmann et al. (2013 Table 6) and Scholl and Taylor (2010) had these same limitations. If ours are invalidated, then theirs are invalidated too. That would remove the Scholl & Taylor (2010) case, the only case where a timber-inventory estimate was close to a tree-ring estimate (Appendix S1 Table S1). It also means there would no longer be any valid independent support for the tree-ring reconstructions of Scholl and Taylor (2010). Yes, better matching of tree sizes in Baker and Hanson's Table 1 does reduce the range of correction multipliers from 1.6-3.2 to 1.6-2.3, which we show here in a revised table (Appendix S1 Table S1). But, this does not change the general conclusion that these initial empirical comparisons are roughly congruent with early reports documenting needed correction multipliers of 2.0-2.5.

Regarding Munger (1917) it is clear that Munger (1912) stated, as Hagmann et al. quote, that the yields were likely high in the selected stands for the reasons he explained, but it is also clear that in 1917 he considered the tree densities to be from "representative stands" as we explained in Baker and Hanson (2017). It is possible for yield to be high but density representative, which we think was definitely Munger's interpretation of his data. We left out the low-density LaPine site because Munger (1912) described this site, which is on pumice: "The forest is rather open, except for thickets of lodgepole pine, and consists largely of rather old and short boled yellow pines." Unlike other sites where he reported both "Yellow pine" and "Others" Munger did not report "Others" for the LaPine site, where he obviously omitted most of the tree density, which was in the lodgepole pine thickets typical of the pumice area. This omission makes comparison inappropriate.

Regarding the two concerns in Hagmann et al. Table 2 with Merschel et al. (2014), first, the Merschel et al. sample may be a little biased by the criteria they used, but this is a minor bias compared to the placement of timber inventories into areas with large trees, which should have favored higher numbers of large trees/ha, not lower numbers of large trees/ha relative to Merschel et al. Mostly, Merschel et al. selected areas with enough large trees to enable them to reconstruct historical forests, and > 5 large trees/ha is not many, not enough to lead their findings to be off enough to explain the disparity between Hagmann et al. and Merschel et al. Regarding the second concern, this does not much affect our estimates--we used data from their Figure 2 for Persistent Shade Tolerant and Persistent Ponderosa Pine. Merschel et al. said more about this than Hagmann et al. quoted:

> "Overestimates are most likely to occur for shade-tolerant species in the Persistent Shade Tolerant type as grand fir releases following harvest of an existing ponderosa pine canopy (Seidel 1981). However, we included shade-tolerant species in our historical estimates of large-tree density in the Persistent Shade Tolerant type because stand structure and age structure indicated they were present prior to land-use changes...The slow growth of mature ponderosa pine and lack of evidence of old shade-tolerant species suggest that the reconstructed density of ponderosa pine alone best represents historical densities of large trees in the Recent Grand Fir and Persistent Ponderosa Pine types" (p. 1682-1683).

Thus, only in Persistent Shade Tolerant, which is the 52.0 value in our "48.0-52.0" estimate, is there likely to be an overestimate, and it likely is not much, not enough to explain the difference between Hagmann et al. and Merschel et al. We stand by this comparison as generally valid.

Regarding Morrow (1985), yes it is correct that Morrow selected stands as Hagmann et al. quote, but based on the mean densities of 48-52 large trees/ha shown by Merschel et al. (2014)

this should not have been a very atypical set of two stands. We did not emphasize this comparison as having much value, since the Morrow site is far away and it is on pumice. However, the Morrow tree densities of 133-152 trees/ha would be above the 95th percentile in Hagmann et al. (2013) of 121 trees/ha and Hagmann et al. (2014) of 120 trees/ha. The correction multipliers remain legitimate to explain a large difference that is unlikely to be from Morrow being atypical.

In summary, some quibbles of Hagmann et al. appear valid, others we think are not valid, but in general these quibbles have little effect on Baker and Hanson's (2017) corroboration of the early documentation of the need for correction multipliers, and the main findings of Baker and Hanson (2017) remain uncontested by Hagmann et al, as discussed in the main text. We think quibbling further is unlikely to provide the necessary extensive, matching, and detailed evidence needed to resurrect invalidated and abandoned early timber-inventory data, if that is even possible.

Appendix S1 Table S1. Cross-validations of early two-chain-wide timber-inventory estimates and GLO estimates with tree-ring and plot estimates of historical tree density. This is an update of the original Table 1 in Baker and Hanson (2017), with better matching of tree sizes.

Author	**Min. dbh of trees (cm)**	**Timber inventory (trees/ha)**	**GLO (trees/ ha)**	**Tree-ring (trees/ha)**	**Plot (trees/ ha)**	**RMAE (%)**	**Needed correction multipliers**
Scholl & Taylor (2010); Scholl & Taylor (2010)	15.2 15.0	99.4†		86.2‡		15.3	0.9
Baker (2015); Merschel et al. (2014)	51.0 50.0		54.6§	48.0-52.0§		5.0-13.8	0.9-1.0
Baker (2012); Morrow (1985)	10.0 10.0		175.0¶	167.0¶		4.8	1.0
Baker (2014); Scholl & Taylor (2010)	10.0 10.0		160.0¶	160.0¶		0.0	1.0
Hagmann et al. (2014); Munger (1917)	15.0 15.0	66.0			105.0- 147.0	37.1-55.1	1.6-2.2
Collins et al. (2011)-MC; Scholl & Taylor (2010)	15.2 15.0	52.0		86.2		39.7	1.7
Collins et al. (2015); Scholl & Taylor (2010)	15.2 15.0	48.1		86.2		44.2	1.8
Hagmann et al. (2014); Merschel et al. (2014)	53.0 50.0	26.0§		48.0-52.0§		45.8-50.0	1.9-2.0
Collins et al. (2011)-PP; Scholl & Taylor (2010)	15.2 15.0	44.0		86.2		49.0	2.0
Hagmann et al. (2014); Morrow (1985)	15.0 15.0	66.0		133.0-152.0		50.5-56.6	2.0-2.3

Notes: Studies are ordered sequentially by needed correction multipliers. In Author column, the top line is timber inventory or GLO and the bottom line is tree-ring or plot. PP, ponderosa pine; MC, mixed-conifer; dbh, diameter at breast height; GLO, General Land Office; RMAE, relative mean absolute error, the absolute value of the difference between the timber-inventory or GLO estimate and the tree-ring or plot estimate as a percentage of the tree-ring or plot estimate.

† All comparisons are for just conifers unless specified otherwise.

‡ All comparisons are for the whole study area, except this one is for the timber-inventory area.

§ These estimates are for only large conifer trees, with slightly varying lower limits: 53 cm dbh for Hagmann et al. (2014), 51 cm for Baker (2015), and 50 cm for Merschel et al. (2014).

¶ This estimate is for all trees, not just conifers.