Earth Syst. Sci. Data Discuss.,
doi:10.5194/essd-2017-22-RC2, 2017

Open Access Earth System Science Data Discussions

Interactive comment on "Spatial and temporal patterns of plantation forests in the United States since the 1930s: An annual and gridded data set for regional Earth system modeling" *by* Guangsheng Chen et al.

Anonymous Referee #2

Received and published: 11 May 2017

Overall Quality: The goal of developing a spatial dataset of historical forest plantation activity is worthy and could lead to valuable data for a wide array of scientific studies. However, this manuscript is difficult to understand and perhaps is fundamentally flawed in approach. Of primary concern is incorrect assumptions embedded in the computational technique (Equation 1; see specific comments below). Beyond that, the approach results in a dataset of unknown quality and misleading in what it represents (basically backcasting the spatial distribution of historical plantation activity based on a spatial distribution from a single point in time). Furthermore, the approach used to aggregate fine-scale data to a coarse resolution (8 km grid cells) is not detailed, leaving

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the user/reader uncertain as to what is represented in the final dataset.

Specific Comments: The fundamental allocation of FIA plot data to grid cells appears to come from Equation 1 (line 149). The authors are slightly inaccurate in their description of fuzzing and swapping of plots in lines 140-146. FIA "fuzzes" the coordinates of plots by adding a random error to published coordinates. The "swapping" is a further step in which the measurements obtained at one plot are "swapped" with the location of another plot with similar ownership and geography. The 675 meters cited by the authors was the amount that plot coordinates were rounded to in the Eastwide Database (EWDB), the mechanism for FIA data delivery prior to around year 2000. Currently, the policy is that plots are "fuzzed" to within about 0.5 miles (800 m; see O'Connell et al., 2015). Regardless, the authors use the 675 m as the "represented area" of a plot. This is incorrect. FIA computes the area represented by a plot based on sampling design and forest area estimates; this area is usually about 5,000 to 6,000 acres (in the South). Thus, the actual area represented by an FIA plot (about 2,400 ha) is more than 50 times the value used by the authors in Equation 1 (675 m x 675m = 45.56 ha). Perhaps this error necessitated the adjustment mechanism used by the authors to force the gridded estimates based on this equation to match state or county estimates (section 2.7 of the manuscript).

Lines 233-236: The authors chose to provide datasets at 1 km and 8 km resolution. Why were these chosen? Average pine plantation areas (stands) in the US South tend to be around 50 acres (20 ha). Thus, an 8 km grid cell (6,400 ha) could contain hundreds of planted stands, of varying ages and species. The 1 km resolution is much more reasonable, given the precision of the data used (e.g., 250m pixels for forest species). It is questionable whether land use dynamics that operate at a 20-ha scale are adequately represented in 6,400-ha data.

The approach described by the authors (unless I misunderstand) seems to use the gridded distribution of plantation area from 2000 to 2004 to compute percent of a grid cell composed of forest plantations. This same spatial distribution is used to apply to

regional/state estimates of plantation area for all other years. Thus, while this approach is based on available data, the implication for users of this dataset is that the land use dynamics of 2000-2004 are the same that have existed since 1924. This is highly unlikely, and gives a false impression to users of this data. For example, pine plantations have existed in the coastal plain for decades, but generally have given way to encroachment of development in rapidly urbanizing coastal areas such as Charleston, SC and Jacksonville, FL. Similarly, there have been back-and-forth dynamics between planted forest and agriculture, driven by incentives to landowners and crop and timber prices. A spatial dataset of historical plantation locations based on current distributions will mislead users that don't take the time to understand the approach used to develop this data.

There is confusion in the paper between annual rates of plantation and cumulative area planted. Figure 5 and Figure 8 clearly show different data (Y-scale is very different), yet the figure captions both mention "annual" planted area. Clearly, plantations on a 20-35 year rotation will turn over multiple times during the 80 years of this dataset, making cumulative estimates meaningless.

Finally, much of the discussion in Section 3 pertains to trends in planted area, species distributions, etc., that are inputs to this research, not results. Planting rates, spatial distribution patterns, and management practices have been widely discussed in the forestry literature; the authors should either briefly summarize and cite other primary literature or leave much of this discussion out.

Technical Corrections: The manuscript will need considerable editing for language/syntax correction. Line 105: Fig. 1 shows, not showed. Lines 117-123 are not needed as there is a figure showing which states belong to the various regions. Line 130: "despite of some inaccuracy"; strike "of" Line 149: what is the meaning of the subscripts mn? Line 170: Oswalt et al. include data for all regions for 2013; this line should state 2014-2011. Line 171: Figure 6 should be Figure 5. Line 171-173: The authors discuss increases in annual planting area. They should either describe

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the reasons (Soil Bank programs, policy incentives) that are well documented in the literature or omit this. Line 203: Figure 7 should be Figure 6. Line 241: Section 2.3 should be 2.4 Line 242: Section 2.2 should be 2.3

References: O'Connell, Barbara M.; LaPoint, Elizabeth B.; Turner, Jeffery A.; Ridley, Ted; Pugh, Scott A.; Wilson, Andrea M.; Waddell, Karen L.; Conkling, Barbara L. 2015. The Forest Inventory and Analysis Database: Database description and user guide version 6.0.2 for Phase 2. U.S. Department of Agriculture, Forest Service. 748 p. [Online]. Available at web address: http://www.fia.fs.fed.us/library/databaseâĂŘdocumentation/.

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