Thank you for the comments and suggestions. These comments were very helpful for revising and improving our paper. We have responded to the comments point by point.

Reviewer #3:

General comments:

This manuscript describes the development and details of a land-use dataset for the United States for the years 1630-2020. The dataset differs from other land-use datasets in that it is a high-resolution product, for almost 400 years of the historical period. The dataset combines multiple different input datasets, for different time-periods, and in different formats/spatial resolutions and reconstructs the historical areas of cropland, pasture, urban land, and forests annually at 1km x 1km spatial resolution, for the CONUS. The results show expansion of cropland and urban areas, with associated losses of natural vegetation. Comparison with other datasets show many areas of qualitative agreement, with some interesting differences for some time periods and land-use types.

Overall, the manuscript is mostly well-written and organized. It includes some useful information about the dataset development process, and an analysis of the resulting products. The dataset will be useful to modelers working in the areas of climate and ecosystems to better understand the high-resolution impacts of LCLUC in the CONUS over a long historical period. A few areas for improvement include:

Specific comments:

Comment 1: Although other alternative datasets are mentioned and compared with the new dataset, it would be helpful to know what advantages those other datasets might have (if any) over the new dataset (e.g. for HYDE an even longer time period is used, and for some datasets there could be additional data layers beyond the ones provided in this dataset, etc).

Response: Thank you for this suggestion. We add the related discussion in section 4.3, please see Lines 558-567.

The newly developed LULC dataset reconstructed the LULC history with more LULC types than ZCmap and YLmap and has higher spatial resolution than HYDE and LUH2. Our LULC data emphasizes the accuracy of area change resulting from LULC conversion rather than the changes in LULC structure or attributes. For example, forest

management (e.g., wood harvest and thinning) results in the forest cover decreases and ecosystem function change, but the LULC type is unchanged. HYDE and LUH2 not only have a more extended cover period, but also provide more sub-types and LULC attributes. HYDE classified cropland into rain-fed rice, irrigated rice, rain-fed other crops, and irrigated other crops (Goldewijk et al., 2017). LUH2 divides cropland into C3 crops and C4 crops and includes the wood harvest (traditional fuelwood, commercial biofuels, and industrial roundwood) and primary/secondary forest age (Hurtt et al., 2020). In the future, the LULC sub-types (e.g., tree species, crop types) and attributes (e.g., forest age, management intensity) through collecting from agricultural census data and forest inventory data can be incorporated into our dataset (Thompson et al., 2013; Chen et al., 2017; Crossley et al., 2021).

References:

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Comment 2: There are different versions of HYDE3.2 – it would be good to know which one was used in this manuscript.

Response: Thank you for this suggestion. The HYDE3.2 baseline version was used, and we add the information in the Table 1.

Comment 3: Does the pasture category in the dataset include natural grasslands, as well as managed grasslands and rangelands?

Response: Thank you for this suggestion. In this study, pasture is defined as a land cover/use category of land managed primarily for the production of introduced forage plants for livestock grazing, consistent with the National Resource Inventory. So, it doesn't include natural grasslands and rangelands.

Comment 4: I also had a bit of confusion about the forest category in the dataset – is it primarily about land that is being used as a forest (regardless of the numbers or ages of trees)? Or is it based more on forest land cover? This distinction between land use and land cover could be discussed a bit more to help with this. There are several places in the manuscript where the authors state that forest area decreased due to wood harvest or fuelwood extraction, but if that did not result in a conversion to another land-use type, then the forest area would not be changed (even if the land cover changed).

Response: Thank you for this suggestion. In this study, we use the forest definition from FIA. Forest is the land at least 10 percent stocked by forest trees of any size, or formerly having such tree cover, with a minimum area classification of 1 acre (https://www.fia.fs.fed.us/tools-data/maps/2007/descr/yfor_land.php). The newly developed forest dataset doesn't include the tree numbers or age information, and it is land used as forest.

Moreover, we agree your opinion about the wood harvest or other management activities may not change the land use type. If the forest land is cleared, the forest land will be converted to another LULC type. We revise the related description in the manuscript.

Comment 5: I found the color scale on figures 5 and 7 quite difficult to read to distinguish between the various land-use colors.

Response: Thank you for this suggestion. For figure 5, the color of pasture and grassland makes people difficult to read. We change the colors and update the figure to make it easy to read. Please see Figure R1 (Figure 8 in the revised manuscript).

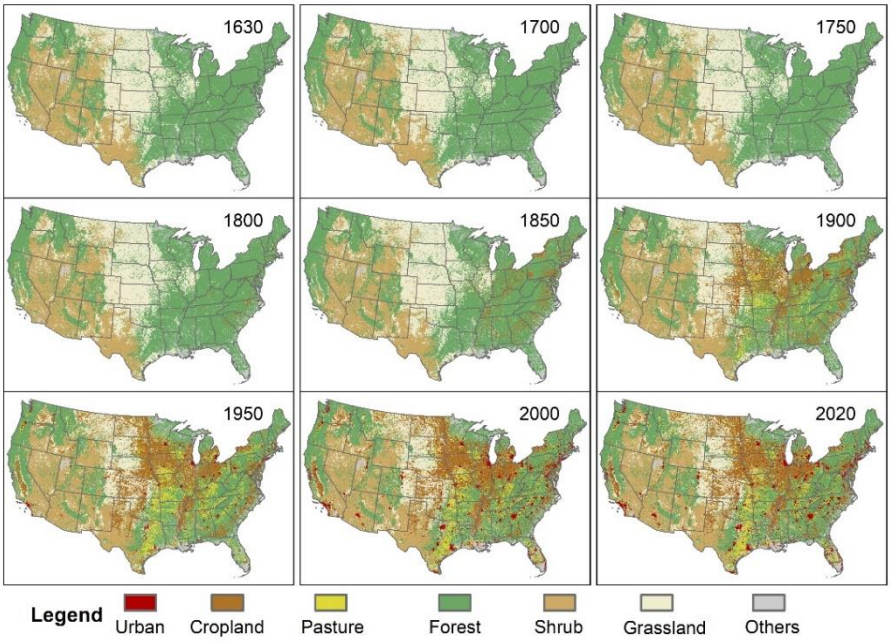

Figure R1: Spatial and temporal patterns of land use and land cover in the conterminous United States during 1630-2020.

In Figure 7, there are 12 types of LULC conversion to show and it is hard to assign a suitable color, so we add a table (Table 3) to show the LULC conversion area in four periods (1630-1850, 1850-1920, 1920-2020, and 1630-2020).

Comment 6: Overall, I think a discussion of the differences between land-use and land-cover and how that is represented in this dataset would be a helpful addition. Also, some more discussion of how this product differs from the technical details of other products and in what ways that is useful and in what ways other products might have some advantages, along with how those differences in underlying details are driving differences in the qualitative dataset results.

Response: Thank you for this suggestion. In this study, our LULC data emphasizes the accuracy of area change resulting from LULC conversion rather than the changes in LULC structure or attributes. For example, forest management (e.g., wood harvest and thinning) results in the forest cover decreases and ecosystem function change, but the LULC type and area is unchanged.

For the technical details, it should include the LULC area reconstruction strategy and spatial allocation strategy. We discussed the LULC probability calculation and spatial allocation algorithm difference between this study and other land use and land cover simulation model. In fact, the key to the spatial allocation algorithm is what ways you choose to allocate the LULC area. Some LULC simulation models allocate the LULC demand (net change) at a LULC base map and generate a new LULC map in the prediction year. But this algorithm will underestimate the gross LULC change area whatever it is used to generate fractional or Boolean type data. It is also not suitable for long-term LULC simulation, because they assumed the LULC probability or suitability surface is stable. In this study, because the contemporary LULC probability pattern is not representative for the early period, we need to modify the probability to make it close to the historical LULC pattern. Therefore, we used the spatial allocation algorithm in this study and generate a map for each year. But this strategy ignores the linkages of landscape in the neighboring two years. Please see Lines 546-567.