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Geoscientific
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Interactive comment on "LUCI-EntEx v1.0: A GIS-based algorithm to determine stream entry and exit points at boundaries of any given shape" *by* Bethanna Jackson et al.

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Thank you very much for the constructive comments. We were intending to address them in a combined response to reviewers, but given understandable delays in the second review coming in given global circumstances, have decided to give an interim response now.

Regarding your comments on the contribution, we completely agree with those and that the first and main contribution you note is is novel and valuable, but also that the further automation and error/issue checking in standard hydrological GIS pre-processing we have implemented may be useful to other researchers although we certainly do not

claim that aspect to be a scientific advance.

We will incorporate most of your suggestions into our revised manuscript once the second review is secured. Although we agree your point 7) would be ideal, and we will add the scale bar and legend, there are some slight privacy issues around the farm locations so we can't fully address the second part of your suggestion.

To address the most substantive of your detailed points, here is the revised, expanded discussion we intend to insert in the revised manuscript detailing the background and start of the art in catchment delineation tools:

Revised paragraph(s) re: catchment delineation tools

Creating a hydrologically and topographically consistent digital elevation model (DEM) with an appropriate stream network is an important part of modelling landscapes in many hydrological applications. Reasonably accurate identification of the stream network is particularly important in understanding transport of water, sediment, nutrients and biomass through a landscape. Terrain analysis of topography data is used to produce catchment boundaries and surface water features through removing pits, calculating drainage directions and flow accumulations, and defining stream channels where pixels exceed an accumulation threshold (Tarboton et al., 1991). The manual process is tedious and has given rise to GIS toolboxes to conduct terrain analysis with some automation to process inputs to spatially model the movement of water and other mass through a landscape (Maidment, 2002).

Popular algorithms for terrain analysis are now commonly embedded in common GIS platforms such as ArcGIS/ArcPro, QGIS, GRASS GIS, SAGA GIS etc. Some standalone tools also exist such as DelineateIT (Sharps et al., 2020), and TauDEM (Tarboton et al., 2009; Tesfa et al., 2011). These tools all are capable of running established hydrological geoprocessing steps; preprocessing a DEM through filling sinks and removing pits, calculating estimates of flow direction and accumulation, extracting stream networks, and producing catchment boundaries. Standalone tools such as DelineateIT and TauDEM include some more complex tools to enable more sophisticated processing. Innovations in these and other research focussed on improving catchment delineation and flow processing have led to the availability of more complex algorithms able to better partition flow, often utilising parallel processing to increase computational efficiency (Tesfa et al., 2011; Haag et al., 2018; Sit et al., 2019). Other research has also utilised complementary satellite data to directly extract surface water features and catchment boundaries (Li et al., 2019) (noting that many DEMs themselves are partly constructed from satellite information among other data sources).

However, these tools have been generally designed and used to understand flow pathways within an isolated catchment or subcatchment, where there is no water transfer from outside the catchment boundary and there is often only one significant outlet to consider. Complexities arise when the area to be modelled covers only part of a catchment or encompasses several subcatchments with multiple entry and exit points along its boundary. This is the case with many farms, forestry units, and other land management units that have been defined according to administrative boundaries rather than natural catchment and subcatchment boundaries.

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Best wishes, the authors.

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