Osceola County – Upper St. Johns Edge Tie Analysis

Report Produced for the U.S. Geological Survey

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Introduction

Dewberry was tasked to evaluate how well the newly produced FL Peninsular Osceola County lidar data (acquired in 2019) ties spatially to preexisting lidar data produced for the Upper St. Johns River Basin (USJRB). The lidar data acquired for USJRB was originally acquired in 2012 for the U.S. Army Corp of Engineers (USACE). Under a separate contract (contract 27877), Dewberry re-processed the 2012 USJRB lidar data to improve the ground classification and overall accuracy. Dewberry has compared the new FL Peninsular Osceola County lidar data to the re-processed USJRB lidar data where the two datasets overlap.

Edge-Tie Analysis

There are 34 FL Peninsular Osceola County tiles which overlap with the USJRB lidar data, shown in Figure 1 below. A difference raster was produced to analyze elevation differences between the two datasets in areas of overlap. Profiles and visual reviews were used to compare the two datasets where the datasets are adjacent, but do not overlap. This review of the adjacent, non-overlapping areas was to ensure no obvious feature discontinuities exist between the datasets. Dewberry has determined that no gross feature discontinuities were identified.

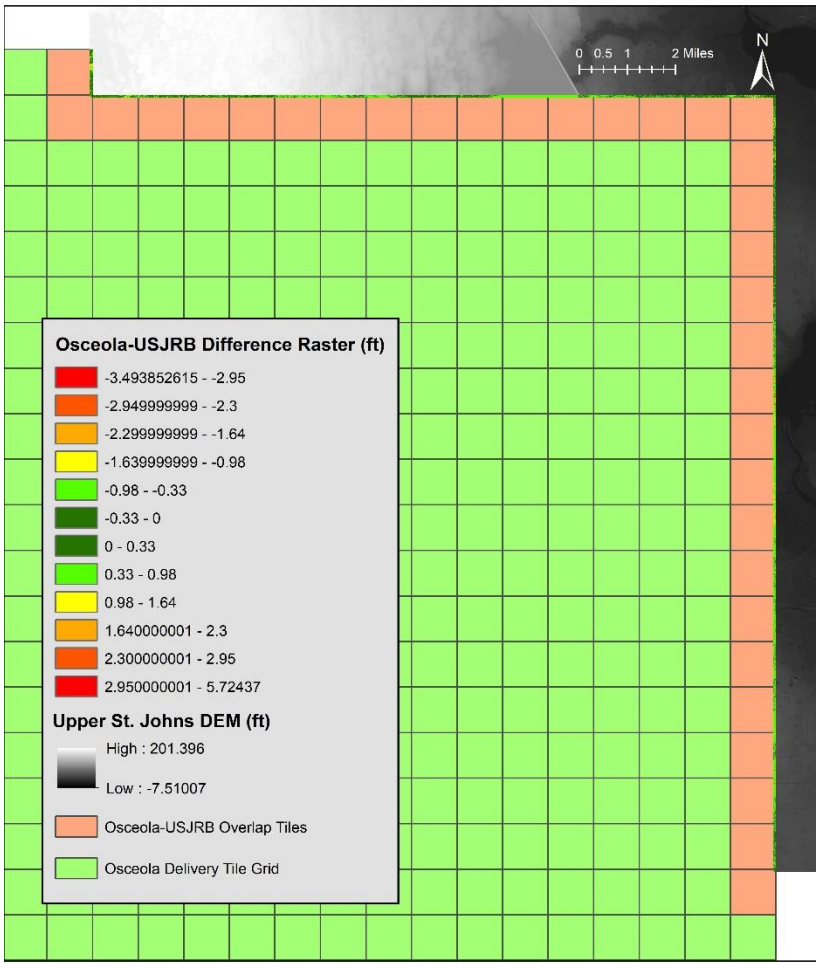


Figure 1-Thirty-four tiles overlap between the Osceola County AOI and previously collected Upper St. Johns River Basin (USJRB) AOI.

DIFFERENCE RASTER

The USJRB DEMs were first re-sampled to match the 2.5 ft DEM size specified for Osceola County so that the data were consistent. Using the 2.5 ft bare-earth DEMs for each dataset, Dewberry created a difference raster by subtracting USJRB data from Osceola County data (Osceola County-USJRB). This difference raster is shown in Figure 2 below.

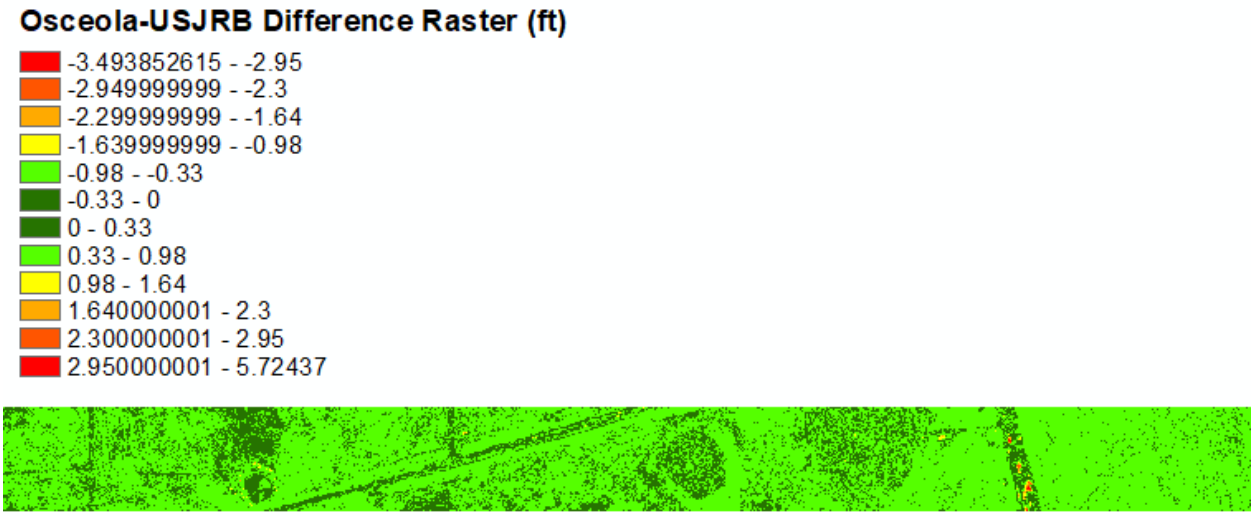


Figure 2-Difference raster and symbology key created for the Osceola County – USJRB overlap.

All hydrographic features breaklined in Osceola County including streams, rivers, ponds, and lakes were excluded from analysis as water levels varied between the two lidar acquisitions. Hydrographic features, overlaid on the difference raster, are shown in blue in Figure 3 below.

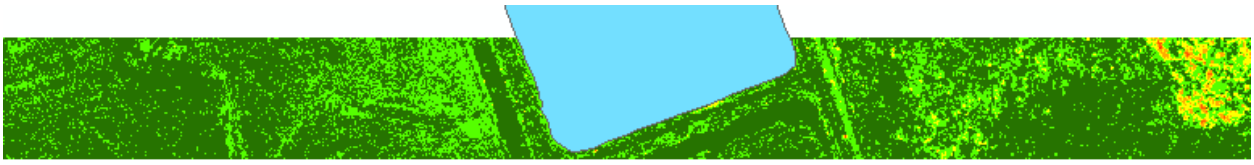
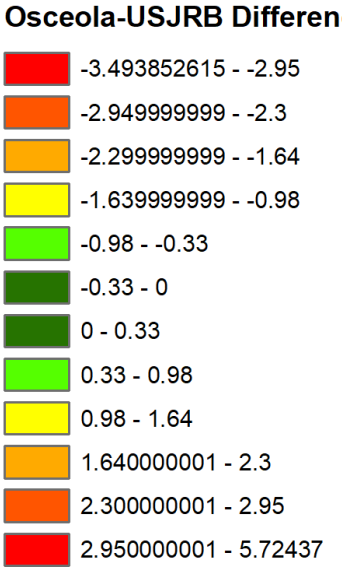


Figure 3-Breaklined hydrographic, shown in blue, were removed from statistical analysis generated from the difference raster as water levels may vary between the different lidar acquisition years.

ELEVATION DIFFERENCE THRESHOLDS

Per client discussions and requests, all overlapping data should be analyzed to show which areas have elevations within 10 cm (RMSEz requirements for USGS QL1 and QL2 data) of each other. As such, pixels in the difference raster representing 0 to+10 cm and 0 to -10 cm of elevation change between the two datasets are binned. From these initial bins, Dewberry then used thresholds of 20 cm up until +/-90 cm as this allows detailed analysis of changes occuring which are less than +/-1 m in difference. The 20 cm bins, starting from the required +/-10 cm bin also allows for analysis of change at +/-30 cm, which is the required VVA for USGS QL1 and QL2 data. Larger elevations differences tend to result from similar or

consistent sources, so after the +/-90 cm bins, data are binned to +/-2.5 m, +/-5 m, and everything greater than +5 m or less than – 5 m. If the units of data are in feet, the metric values listed above are converted to feet for analysis.
Dewberry symbolized the difference raster for this analysis using the binned values and color schema shown below. Values are in feet.



Pixels within the 0 to +/-30 cm (0.98 ft) threshold are colored as green. Dark green is used for pixels in the 0 to +/- 10 cm (0.33 ft) bin and light green is used for the +/-10 cm (0.33 ft) to +/- 30 cm (0.98 ft) bin.

Figure 4 below shows the full difference raster symbolized with the key outlined above.

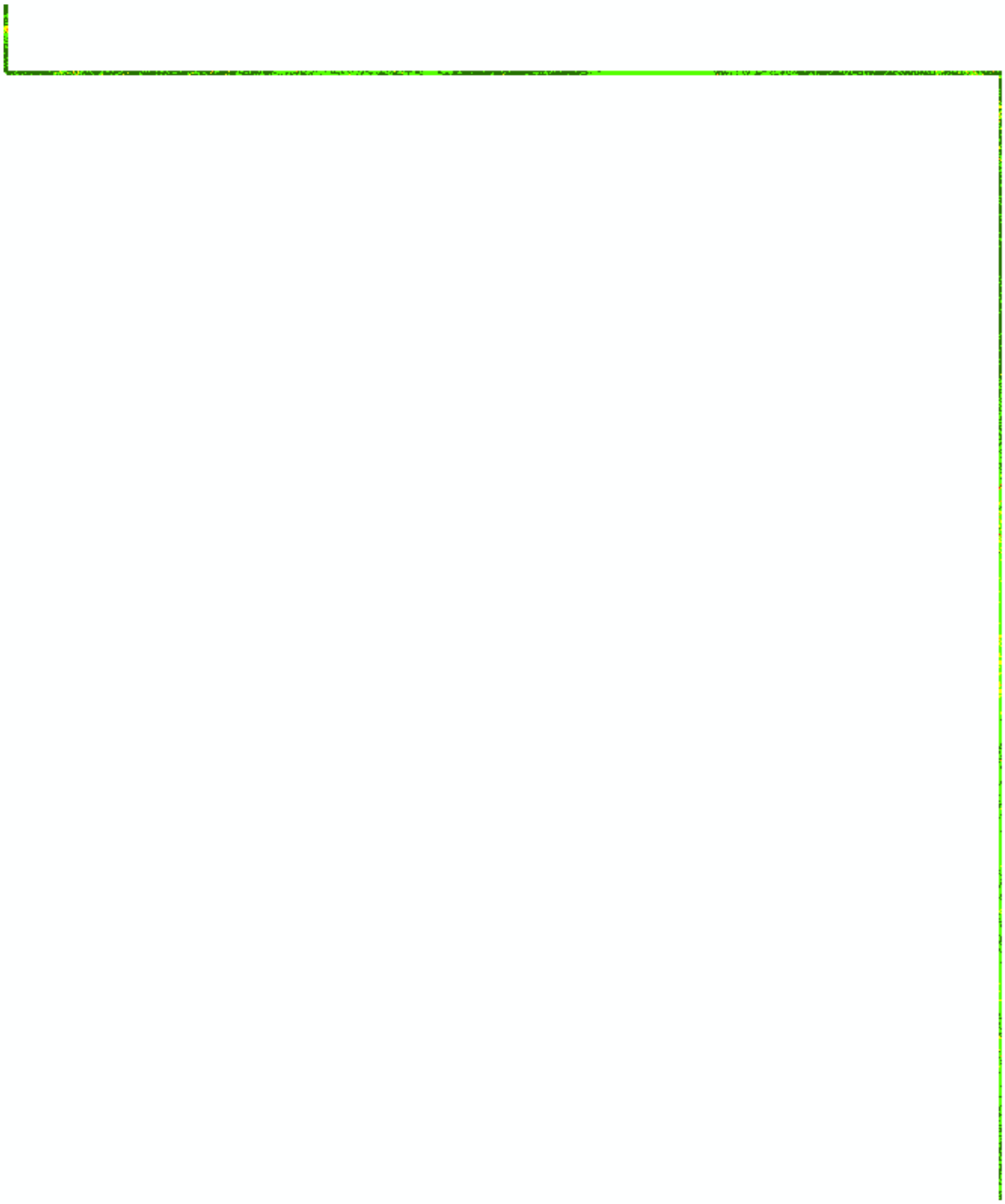


Figure 4- Full difference raster

EDGE-TIE RESULTS

When looking at all overlap areas consisting of all slopes and all land cover types, 49% of the overlapping points are within the 0 to +/10 cm (0.33 ft) threshold with the majority of these points being located in

flat, open terrain. Additional analysis shows 95% of the overlapping points are within the 0 to +/-30 cm (0.98 ft) threshold with the majority of these points being located in vegetated areas. These variations are allowable elevation differences between the two datasets.

The remaining points that exceed +/-30 cm (0.98 ft) are located in areas with temporal offsets. The temporal offsets may occur in dynamic, non-static environments, such as wetlands, marsh, or floodplains, or may occur in less dynamic, upland areas due to man-made or cultural changes.. The temporal offset cause in this overlap area are located in wetland/marsh areas. The differences greater than +/- 30 cm (0.98 ft) are described in the sections below.

Wetland/Marsh Areas

The majority of areas of larger vertical differences between these two datasets occur within dynamic wetland areas. Hydrographic features which were not breaklined in the AOI are included in the difference raster analysis and many of these smaller features also exhibit larger differences between the two datasets. These types of changes are due to the 7 year temporal difference between the two lidar acquisitions as there are clearly changes in the level of water in water bodies and streams, along shorelines,and within marsh/wetland areas. The figure below shows an example of these temporal changes.

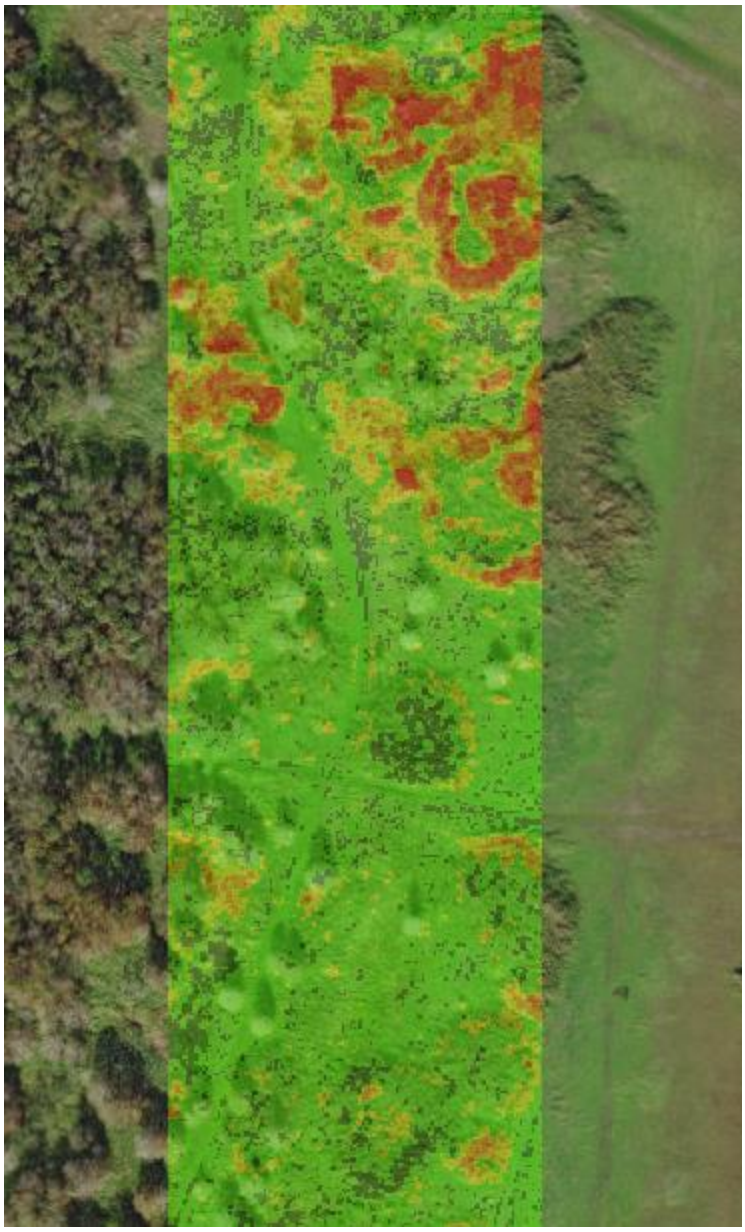


Figure 5-The image shows imagery overlaid with the difference raster (partially transparent). The largest values in the difference raster are over wetland/marsh areas, where a temporal difference of 7 years displays a difference in elevation.

Upland Areas

Upland areas are less dynamic and are expected to remain more constant and stable over time. This land cover type provides more consistent analysis between temporally different lidar datasets. Overall, upland areas between the two overlapping datasets match very well, except for locations of impoundment work having been done in the seven year period between collections.

Figure 6- The image shows imagery overlaid by the difference raster. Upland areas match very well in the Osceola – USJRB overlap area with most upland areas generally matching within ±0.33 feet of each other (dark green in the difference raster).

Summary

Overall the FL Peninsular Osceola County lidar data match well with 49% of the overlap data matching within ±0.33 feet and 95% of the overlap data matching within ±0.98 feet. The areas of largest vertical elevation change occur due to temporal differences and include varying levels of water in hydrographic

features, shoreline changes, and changes in wetlands/marsh areas. Cultural or man-made changes also contribute to larger elevation differences, including new hydrographic control structures, new reservoirs or impoundments, and likely construction/roadway improvements.