FL Peninsular Brevard County - Upper St. John River Basin Tie Analysis

Report Produced for the United States Geological Survey

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Introduction

Dewberry was tasked to evaluate how well the newly produced FL Peninsular Brevard County (acquired in late 2018 to early 2019) ties spatially to preexisting lidar data produced for the Upper St. John River Basin (USJRB) lidar project. The lidar data for the Upper St. John River Basin project was acquired for U.S. Army Corp of Engineers (USACE) in 2012. Dewberry has compared the new Brevard County lidar data to the existing Upper St. John River Basin (USJRB) data where the two datasets overlap.

Edge-Tie Analysis

There are 100 Brevard tiles which overlap with the Upper St. John River Basin 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.

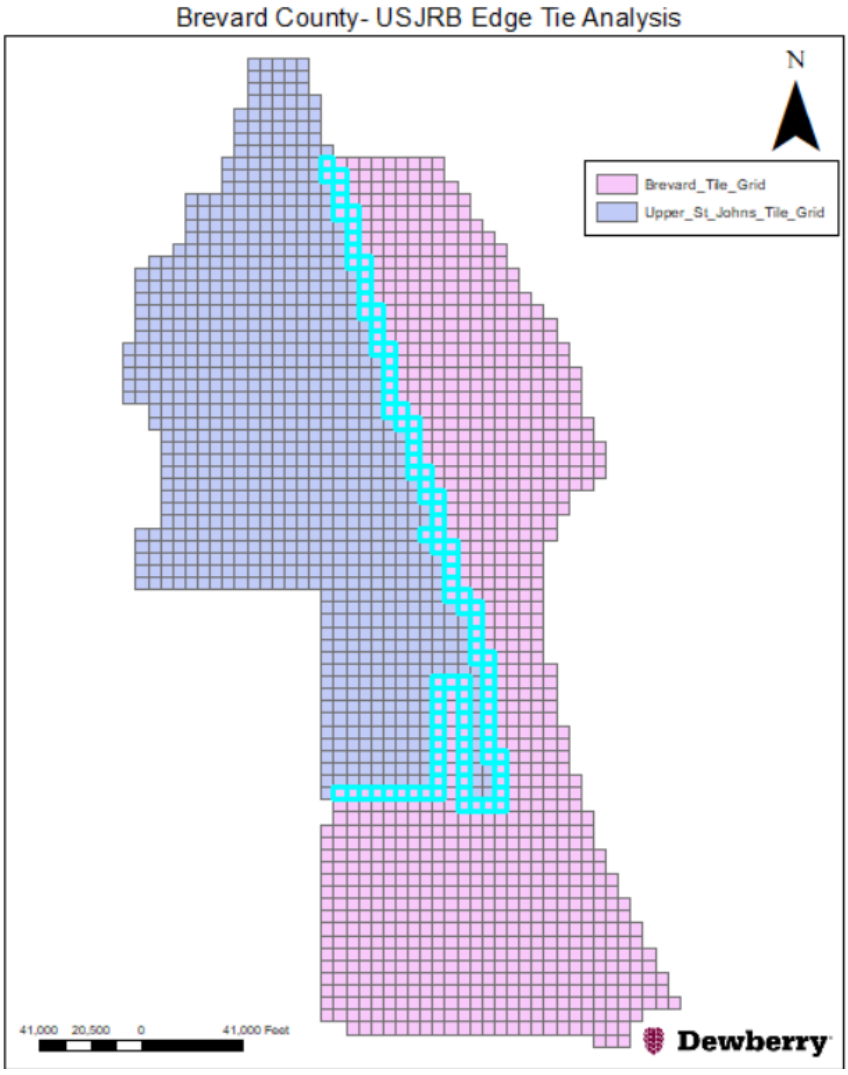

Figure 1- One hundred overlap between the Brevard AOI and previously collected Upper St. John River Basin AOI.

DIFFERENCE RASTER

The USGS Upper St. John River Basin DEMs match the 2.5 ft DEM size specified for Brevard county, the data was consistent. Using the 2.5 ft bare-earth DEMs for each dataset, Dewberry created a difference raster by subtracting Upper St. John River Basin data from Brevard county data (Brevard-Upper St. John River Basin). This difference raster is shown in Figure 2 below.

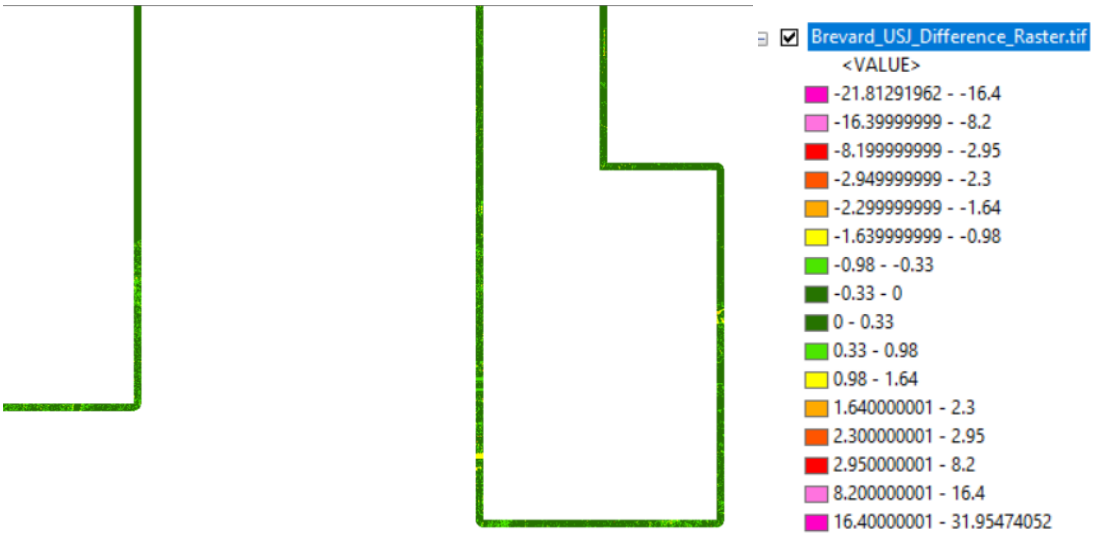

Figure 2-Difference raster and symbology key created for the Brevard- Upper St. John River Basin overlap.

All hydrographic features breaklined in Brevard and Upper St. John River Basin 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.

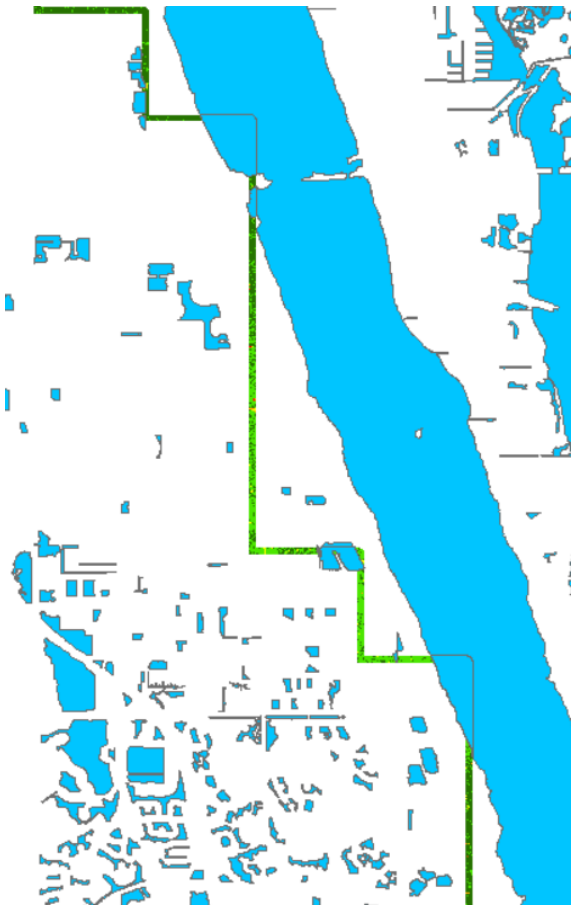

Figure 3-Breaklined hydrographic, shown in blue fill , were removed from statistical analysis generated from the difference raster as water levels may vary between the different lidar acquisition years.

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 rasters for this analysis using the binned values and color schema shown below. Values are in feet.

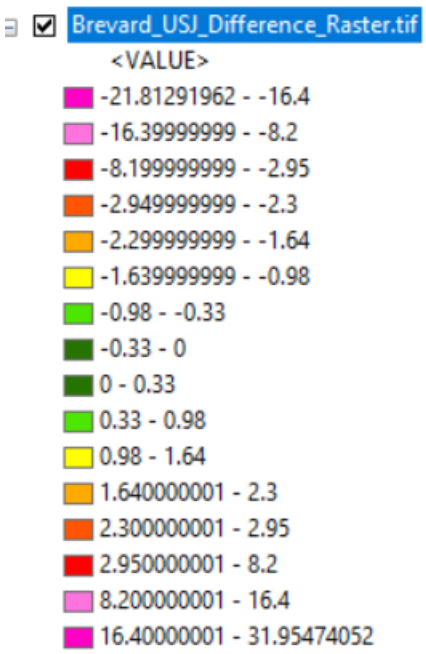

Figure 4- Pixels within the 0 to +/-30 cm (0.98 ft) threshold are colored as green. Dark green is used for pixels in the 0 to +/- 10 cm (0.33 ft) bin and light green is used for the +/-10 cm (0.33 ft) to +/- 30 cm (0.98 ft) bin.

EDGE-TIE RESULTS

Upper St. John River Basin

When looking at all overlap areas consisting of all slopes and all land cover types, 77.4% 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 97.9% 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 primarily located in wetland/marsh areas. The differences greater than +/-30 cm (0.98 ft) are described in the sections below.

VEGETATION, WATER LEVELS, & CULTURAL CHANGES

The majority of areas with larger vertical differences between these two datasets occur within vegetated areas and areas with changing water levels. In some areas cultural changes contributed to the vertical and horizontal differences between datasets. These types of changes are due to the ~6 year temporal difference between the two lidar acquisitions.

The figures below show examples of these temporal changes.

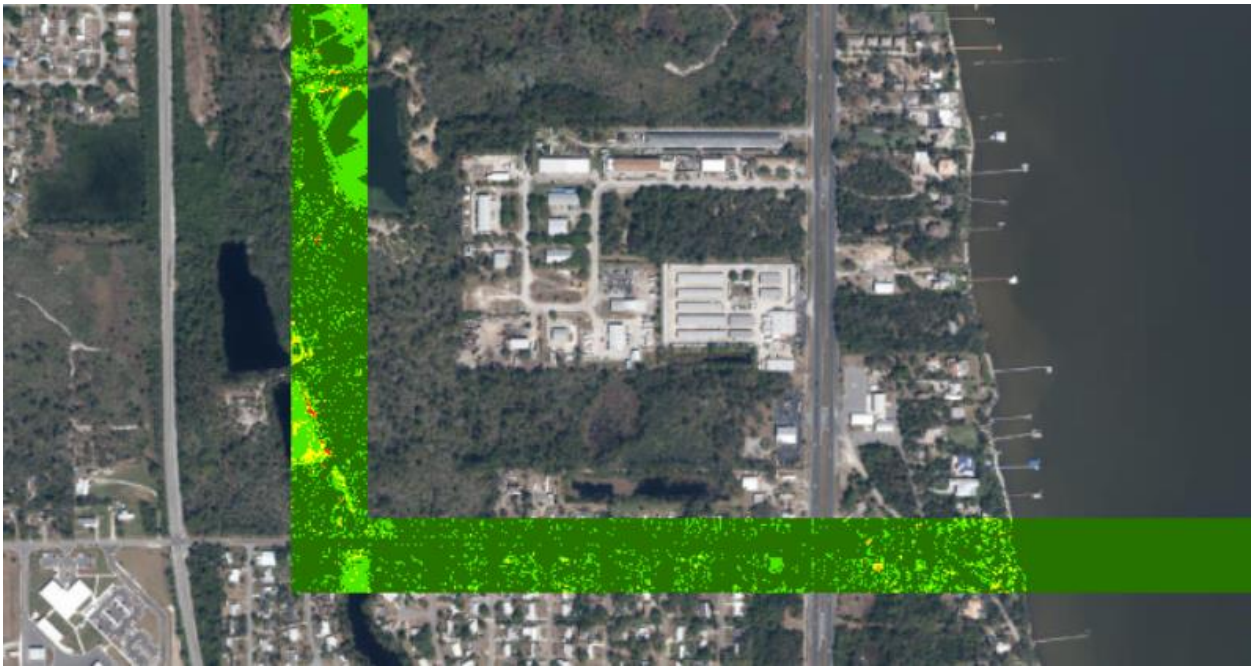

Figure 5- The image above shows an area in the difference raster and basemap imagery with a temporal difference in the dynamic, non-static environments (wetland marsh) as well as water levels where the areas were not breaklined due to the specification requirements.

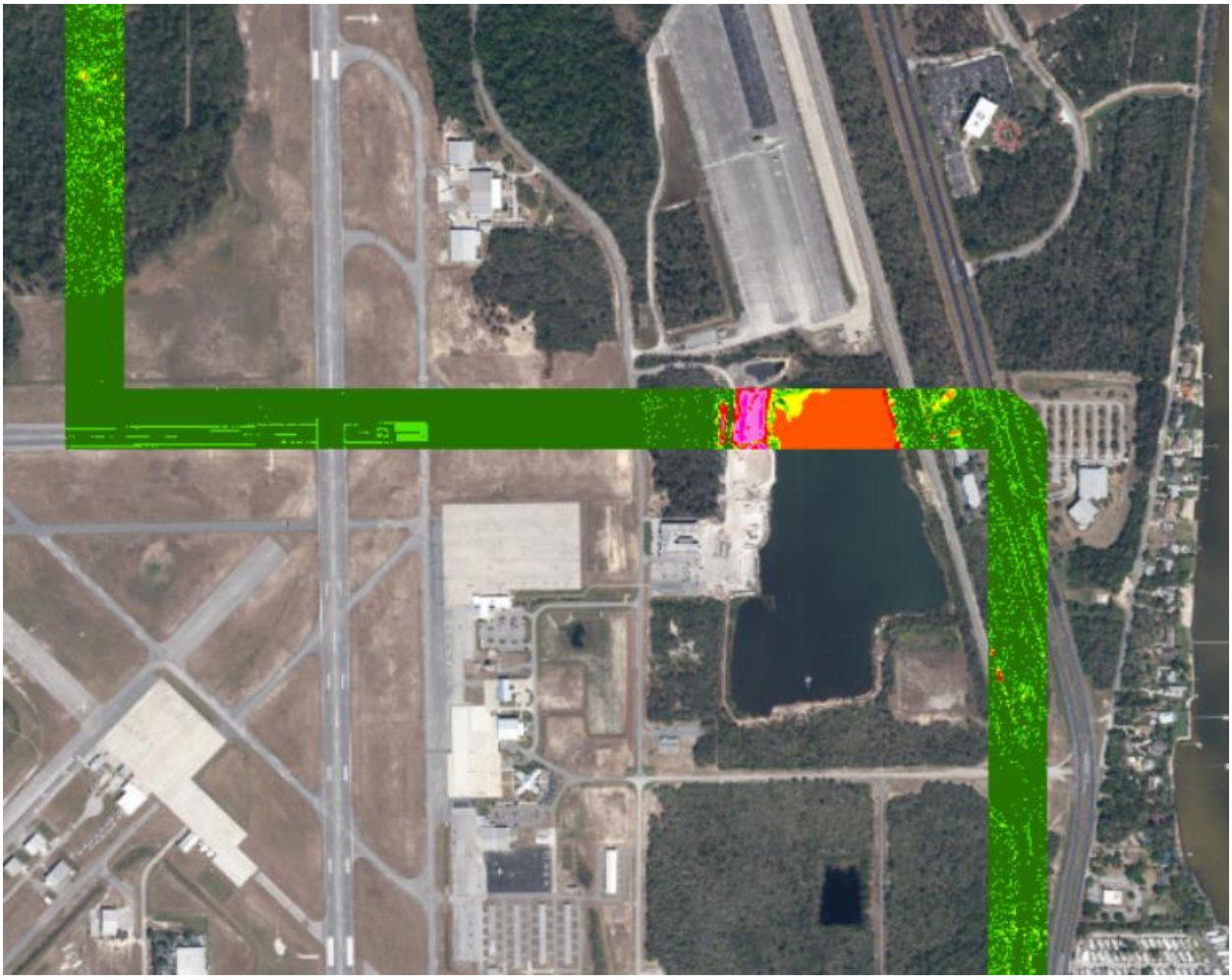

Figure 6- The image above shows an area with horizontal and vertical differences in the difference raster due to cultural changes between datasets.

Summary

Overall the Brevard and Upper St. John River Basin lidar data match well with 77.4% of the overlap data matching within 0 to +/10 cm (0.33 ft) and 97.9% of the overlap data matching within +/-30 cm (0.98 ft). The areas of largest vertical elevation change occur due to temporal differences and include varying levels of water in hydrographic features 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.