FL Peninsular Charlotte County/ Lee County 2020 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 Charlotte County (acquired in 2020) ties spatially to preexisting lidar data produced for the SWFMD Lee County. The lidar data acquired for Lee County was originally acquired in mid to late 2018. Dewberry has compared the new Charlotte County lidar data to the existing Lee County lidar data where the two datasets overlap.

Edge-Tie Analysis

There are 37 Charlotte County tiles which overlap with the Lee County lidar data, shown in Figure 1 below. A difference raster was produced to analyze elevation differences between the two datasets in areas of overlap. Each pixel in the difference raster represents a value of elevation change between the two overlapping datasets. Dewberry has determined that no gross feature discontinuities were identified.

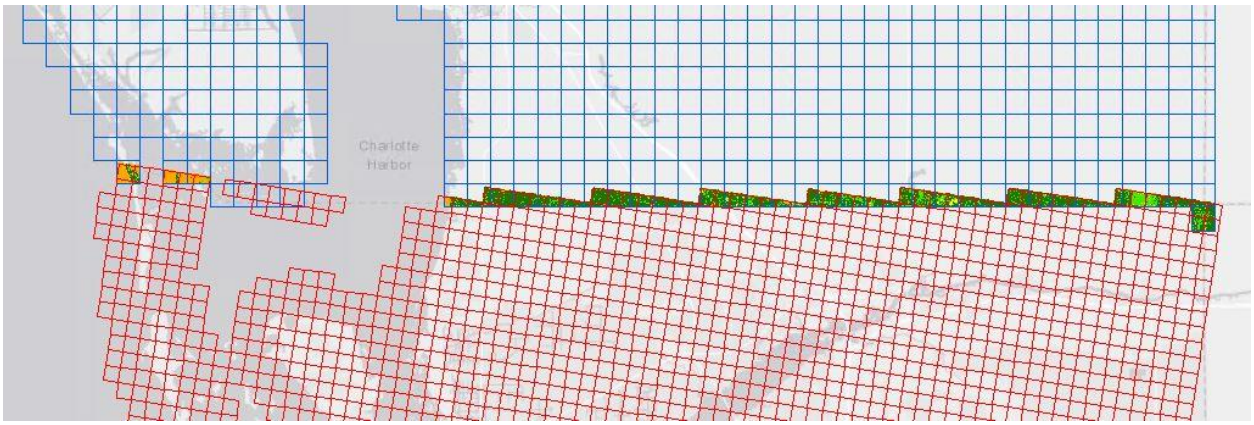

Figure 1-Charlotte County is represented by the blue tiles and Lee County is represented by the red tiles. The difference raster was created were the tiles overlap between the Charlotte County AOI and previously collected Lee County AOI.

DIFFERENCE RASTER

Reprojections and vertical unit conversions were performed if the two datasets had different Coordinate Reference Systems and/or different vertical units. Using the 2.5 ft bare-earth DEMs for each dataset, Dewberry created a difference raster by subtracting Lee County data from Charlotte County (Charlotte-Lee). This difference raster is binned according to pre-determined thresholds, shown in Figure 2.

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.

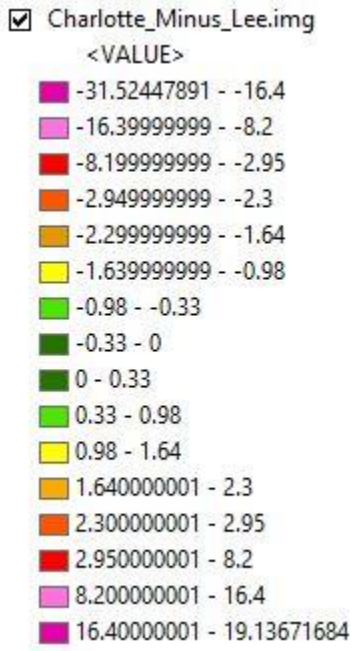

Figure 2-Symbology key, in [feet], showing the values and colors used for each bin. These bins were used to symbolize the difference raster for visual review and quantitaive analysis.

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 3 shows the full difference raster symbolized with the key outlined above.

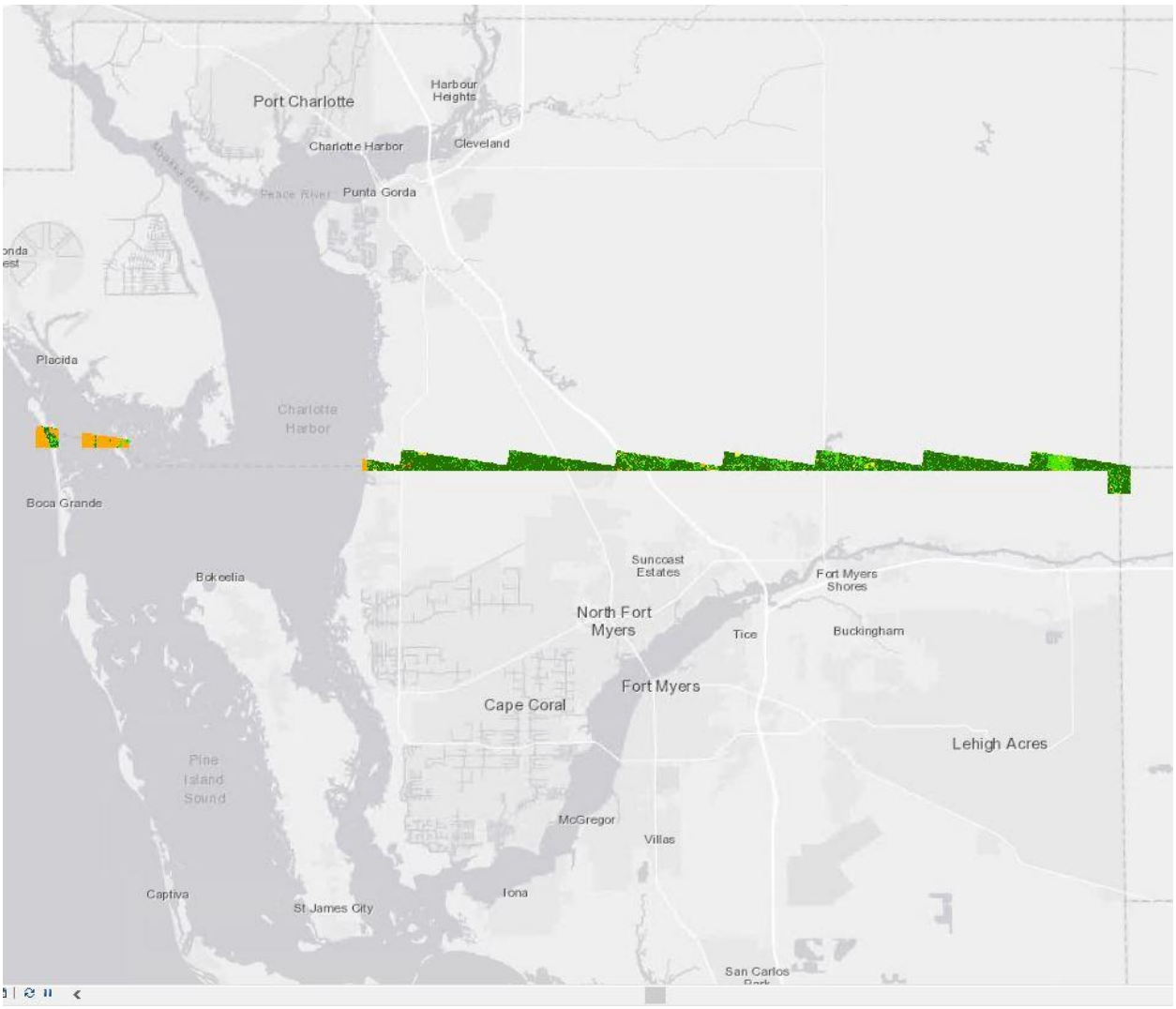

Figure 3-Difference raster, binned using the symbology key outlined above, created for the Charlotte County-Lee County overlap.

All hydrographic features breaklined in Charlotte including streams, rivers, ponds, lakes, and coastal 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 4 below.

Figure 4-Breaklined hydrographic features, shown in blue, were removed from statistical analysis generated from the difference raster as water levels may vary between the different lidar acquisition years.

EDGE-TIE RESULTS

When looking at all overlap areas consisting of all slopes and all land cover types, 79.2% 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 87.8% of the overlapping points are within the 0 to +/-30 cm (0.98 ft) threshold. 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 causes in this overlap area result from changing water levels on non-breaklined hydrographic features (resulting in these changes being included in the difference analysis), erosion and/or deposition changes, bank or channel changes, vegetation changes with marsh or wetlands, new construction, and infrastructure changes. The differences greater than +/- 30 cm (0.98 ft) are described in the sections below.

Vegetation

The majority of areas with larger vertical differences between these two datasets occur within vegetated areas. These types of changes are due to the ~1 year temporal difference between the two lidar acquisitions as there are clearly changes in the vegetation height.

The figures below show examples of these temporal changes.

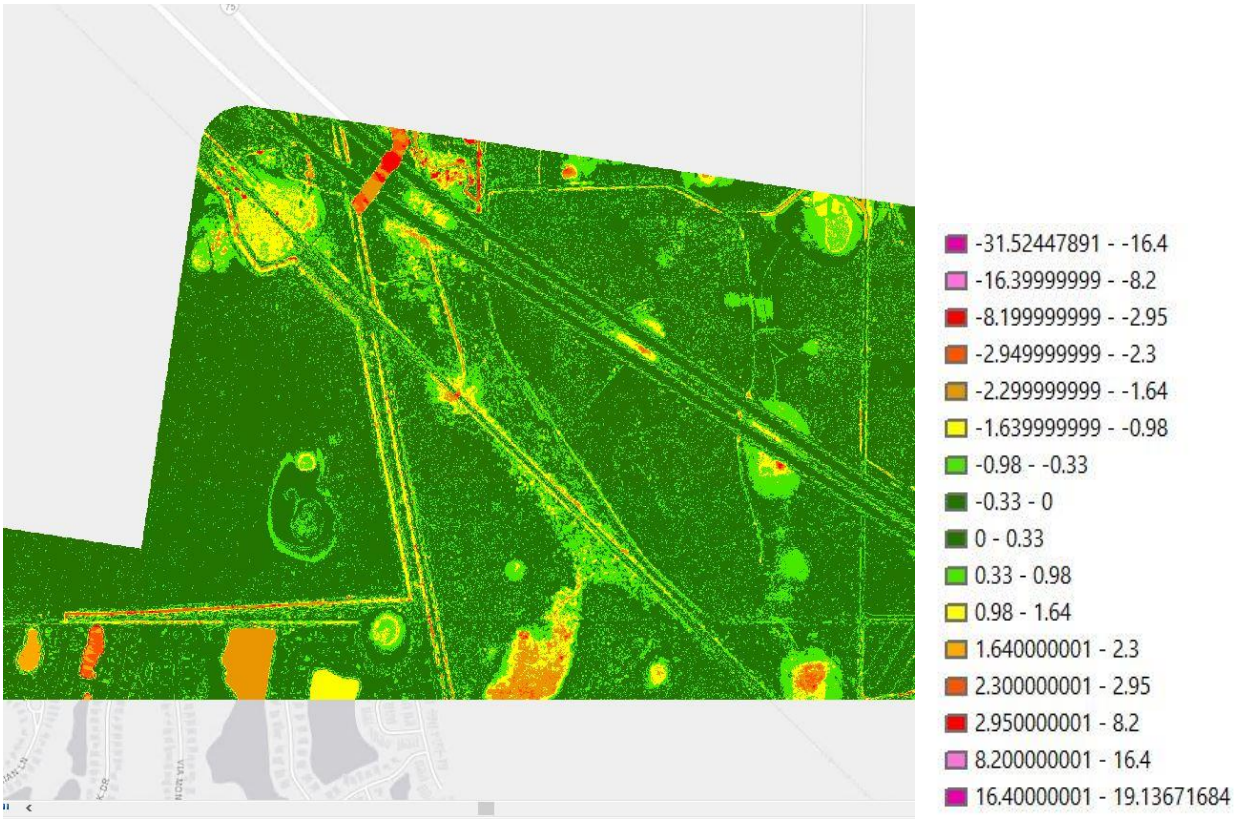

Figure 5-The top image shows the Difference Raster.The larger elevation differences exist in vegetated areas. The difference raster symbology key, in feet, is shown to the right. The bottom image is the base map imagery of the same area. The imagery demastates a difference in the hydrographic features that include water bodies, canals and temporal differences in the wetlands.

Summary

Overall the Charlotte County and Lee County lidar data match well with 79.2% of the overlap data matching within ±10 cm. The areas of largest vertical elevation change occur due to temporal differences and include varying levels of water in hydrographic feature changes, and changes in wetlands/marsh areas. Cultural or man-made changes also contribute to larger elevation differences, waterretention ponds, berms, canals and likely construction/roadway improvements.