Indian River County – Ft Drum 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 Indian River County lidar data (acquired in 2019) ties spacially to preexisting lidar data produced for the Fort Drum Project. The lidar data acquired for Ft Drum was originally acquired in 2017. Dewberry has compared the new FL Peninsular Indian River County lidar data to the Ft. Drum lidar data where the two datasets overlap.

Edge-Tie Analysis

There are 32 FL Peninsular Indian River County tiles which overlap with the Ft. Drum 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.

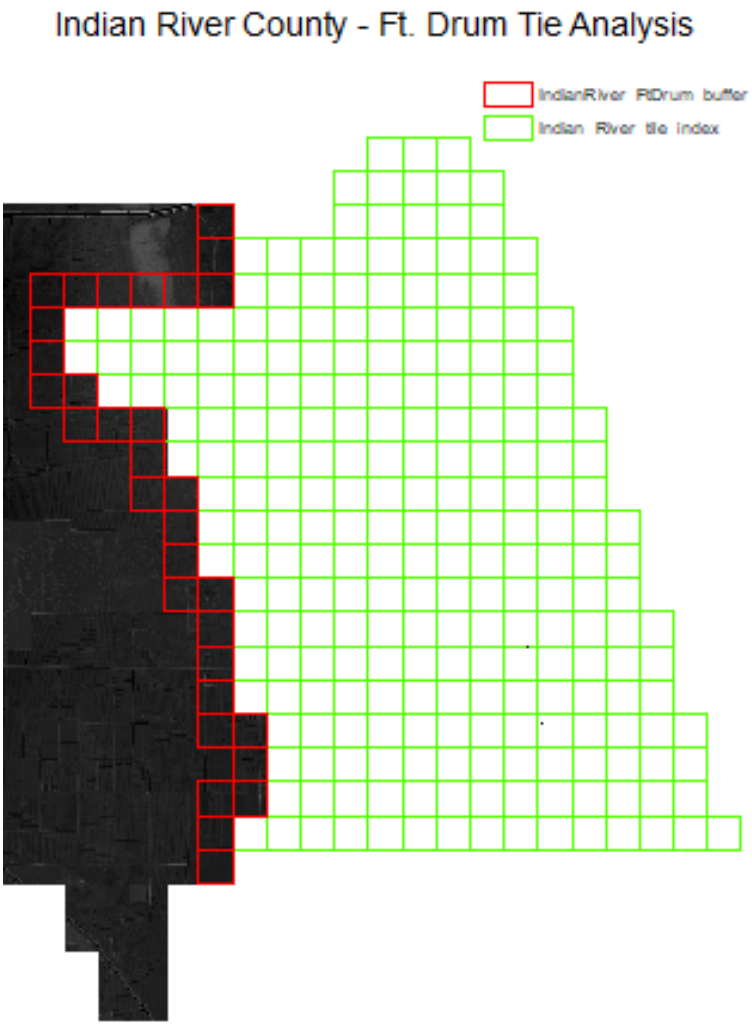

Figure 1-Thirty-two tiles overlap between the Indian River County AOI and previously collected Ft. Drum AOI.

DIFFERENCE RASTER

The Ft. Drum DEMs matched the 2.5 ft DEM size specified for FL Peninsular Indian River County so the data were consistent. Using the 2.5 ft bare-earth DEMs for each dataset, Dewberry created a difference raster by subtracting Ft. Drum data from FL Peninsular Indian River County data (FL Peninsular Indian River County-Ft. Drum). A sample of this difference raster is shown in Figure 2 below.

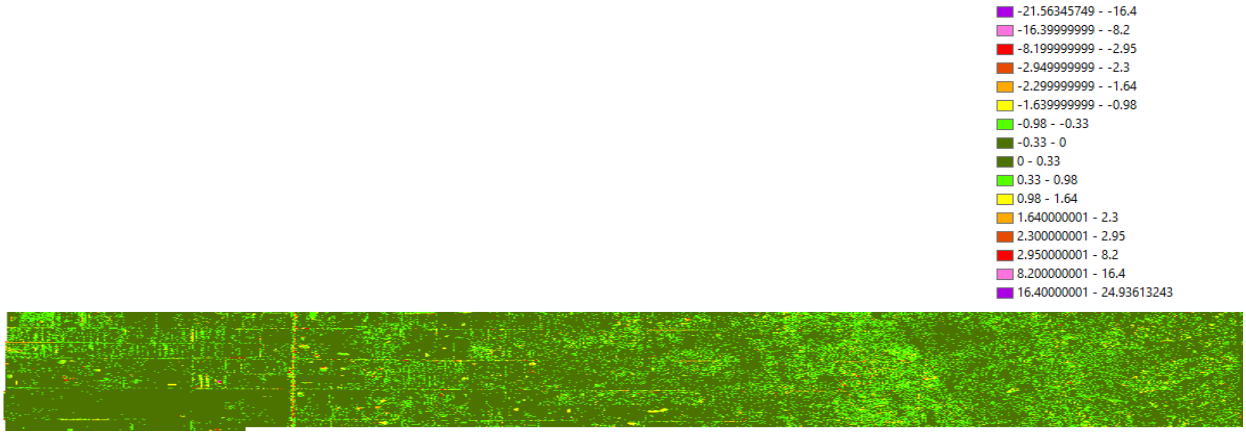

Figure 2-Difference raster and symbology key created for the Indian River County – Ft. Drum overlap.

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.

-21.56345749 - -16.4
-16.39999999 - -8.2
-8.199999999 - -2.95
-2.949999999 - -2.3
-2.299999999 - -1.64
-1.639999999 - -0.98
-0.98 - -0.33
-0.33 - 0
0 - 0.33
0.33 - 0.98
0.98 - 1.64
1.640000001 - 2.3
2.300000001 - 2.95
2.950000001 - 8.2
8.200000001 - 16.4
16.40000001 - 24.93613243

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.

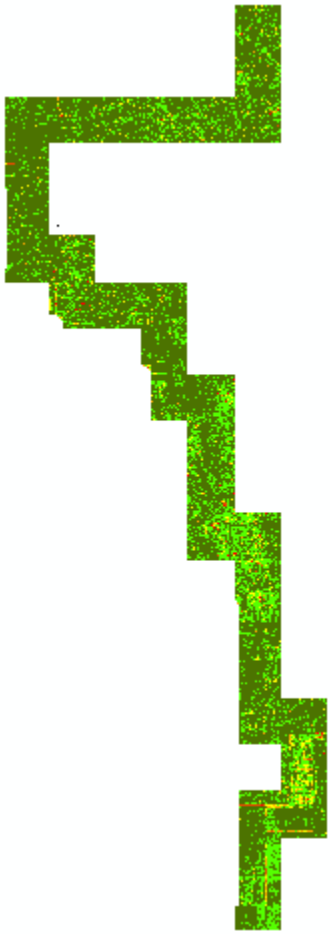

Figure 3- Full difference raster

EDGE-TIE RESULTS

When looking at all overlap areas consisting of all slopes and all land cover types, 74% 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 96% 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 2 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.

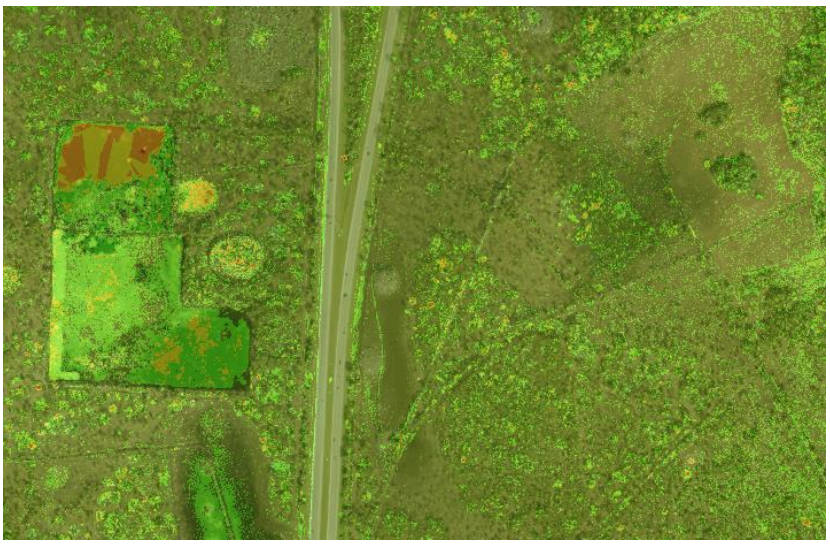

Figure 4-The image shows imagery overlaid with the difference raster (partially transparent). The largest values in the difference raster are over wetland/marsh areas, where there temporal difference of 2 years displays a difference in elevation.

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 construction work having been done in the two year period between collections.

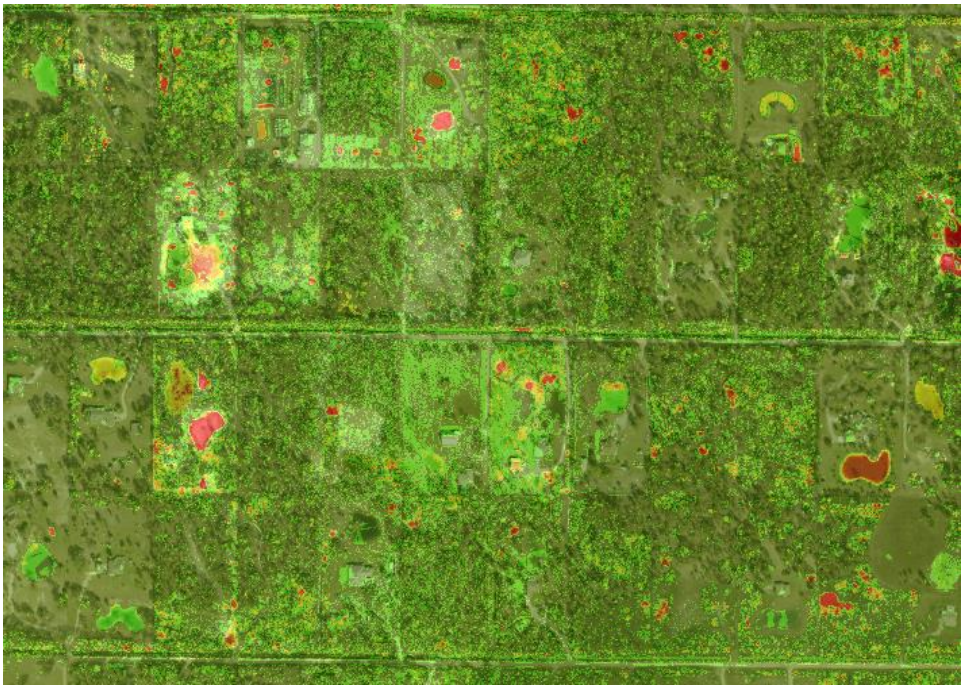

Figure 5- The image shows imagery overlaid by the difference raster..Upland areas match very well in the Indian River County – Ft. Drum overlap area with most upland areas generally matching within ±0.33 feet of each other (dark green in the difference raster).

Summary

Overall the FL Peninsular Indian River County lidar data match well with 74% of the overlap data matching within ±0.33 feet and 96% 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.