# Elevation QC Report

**Project:** OR_GrandeRondeBasin_2009    **Contractor:** Watershed Sciences

**Data Delivery Date:** 04/20/2011    **Date Data Reviewed:** 07/05/2011-07/07/2011

**Reviewer:** Jeremiah Vinyard-Houx    **Total Square Miles Reviewed:** 643.26

**Elevation Type:** LIDAR    **Format:** .img    **Grid Spacing:** 3 int. feet    **Tile size:** 3 75 Quads

**Projection:** SPCS    **Zone:** Oregon North    **Datum:** NAD83    **Units:** International Feet

**Licensing:** Public Domain    **Metadata:** Tile Level

**Materials Received:**

CLICK
   All laser return points--classified (LAS v. 1.2 and ASCII formats; 1/100th USGS quad delineation)
NED
   Ground classified points (LAS v. 1.2 and ASCII formats; 1/100th USGS quad delineation)
   Bare-Earth Model (3-ft ESRI GRID format; 1/4th USGS quad delineation)
Metadata
   LiDAR tile index (shapefile format)
   USGS Quarter Quad Index
   XML files, for each BE raster and indicies
   Full Report containing introduction, methodology, and accuracy (Word, PDF)
Other
   First return points (LAS v. 1.2 and ASCII formats; 1/100th USGS quad delineation)
   2-ft Contours (dxf format; 1/100th USGS quad delineation)
   Intensity Images (1.5-ft GeoTIFF format; 1/100th USGS quad delineation)
   Highest-Hit Model (3-ft-m ESRI GRID format; 1/4th USGS quad delineation)

**Vertical Accuracy Test Performed:** No    **Test Point Source:** Contractor    **RMSE:** .09ft

**Vertical Accuracy Test Notes:**

RTK Survey Sample Size (n): 1230
Root Mean Square Error (RMSE) = 0.09ft (0.03m)
Minimum $\Delta z$ = -1.3ft (-0.4m)
Standard Deviations Maximum $\Delta z$ = 0.32ft (0.1m)
1 sigma ($\sigma$): 0.08ft (0.02m)
2 sigma ($\sigma$): 0.17ft (0.05m)
Average $\Delta z$ = -0.003ft (0.001m)

Resolution: target= = 8 points/m2
         achieved: 7.23 points/m2 (0.7 points/ft2)

**QC Review Summary:**

**Projection and Coordinate System Review:**
      **Projection: State Plane Oregon North**
      **Horizontal Datum: NAD 83**
      **Vertical Datum:NAVD 88 Geoid 3**
      **Horizontal Units: International Feet**
      **Vertical Units: Feet**

**From the original project the Beaver Creek, Lower Catherine, and Upper Catherine datasets were donated to the USGS, see figure 1.**

**Issues with this project's bare earth rasters include no hydro conditioning/breakline enforcement of stream features, several waterbodies not leveled (largely oxbow lakes and chiefly in the lower catherine portion of the dataset, and one bridge not removed. Waterbodies and the bridge were leveled for the final bare earth raster.**

**The Final Raster and Project footprint are located in the NED>Final for NED folder, error tags are located in the NED>Errors Folder. XML metadata and QA/QC reports are avaliable in the the Metadata>documents folder (xml files are avaliable for each quarter quad be raster, Bare Earth tile scheme, and Las tile scheme.**

**Provided hydro features are acceptable, it is recommended this dataset is accepted for the NED.**

**LiDAR Quality Control (QC) Review Process**

*Preparation:*
-Metadata reviewed to determine data projection, datum, format, etc.
-If ARRA contract, check for raw .LAS files, classified .LAS files, breaklines, blind control points,
 and DEM in Image or Grid format
-Open data in Global Mapper

*Vertical accuracy testing:*
-If ARRA contract, use Vertical Accuracy Test Worksheet to perform RMSE on 20 blind point
 positions provided by contractor

*Inspection and Correction of data:*
-Minimum and maximum elevations in dataset; correct if in error
-Appropriate hydro flattening as specified in V12 Lidar Specification (For ARRA/GPSC Data)
-Data void areas
-Data spikes
-Tile edge seam lines
-Non-bare earth surface artifacts (structures, bridges, vegetation, etc.)
-Elevation errors - raised/lowered areas/tiles
-Other surface treatment anomalies
-Check DRGs for correct elevations and horizontal positioning (if test points not available)
-Create footprint (project boundary) shape file and establish square miles
   *During Inspection, identify data errors and create "error" file folder:*
   -Capture geo-referenced JPG or TIFF image(s) of identified errors
   -Copy to Error file
   *During Inspection, level elevations and remove artifacts (these two steps not done for ARRA data):*
   -Level smoothing to remove non-bare earth surface artifacts (structures, bridges, vegetation, etc.)
   -Level data spikes where possible

*Export image files and create project Elevation QC Review Report:*
-Export ERDAS Imagine image files in native projection and resolution
-If ARRA, Copy Vertical Accuracy Test Worksheet into QC Report
-Place QC Review Process and Project Area Extent into QC Report
-If rejected, attach sample geo-referenced JPG or TIFF error images with an explanation of reason
-If rejected, restart QC process when replacement data is received
-Provide completed Elevation QC Review Report to Elevation Supervisor for final viewing
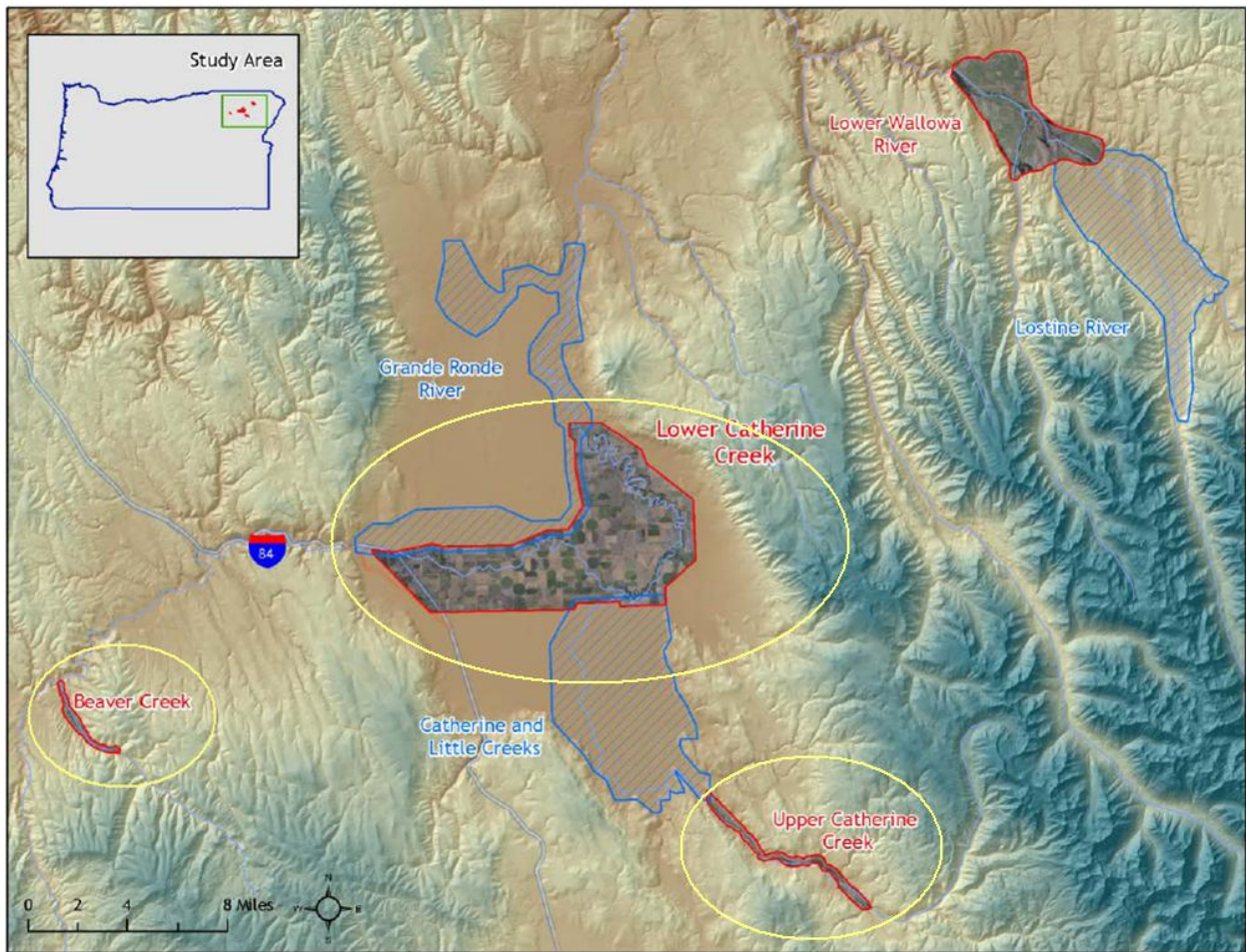-Add QC Report, footprint, Imagine image(s), and Error file to original data file for final shipment to
EROS

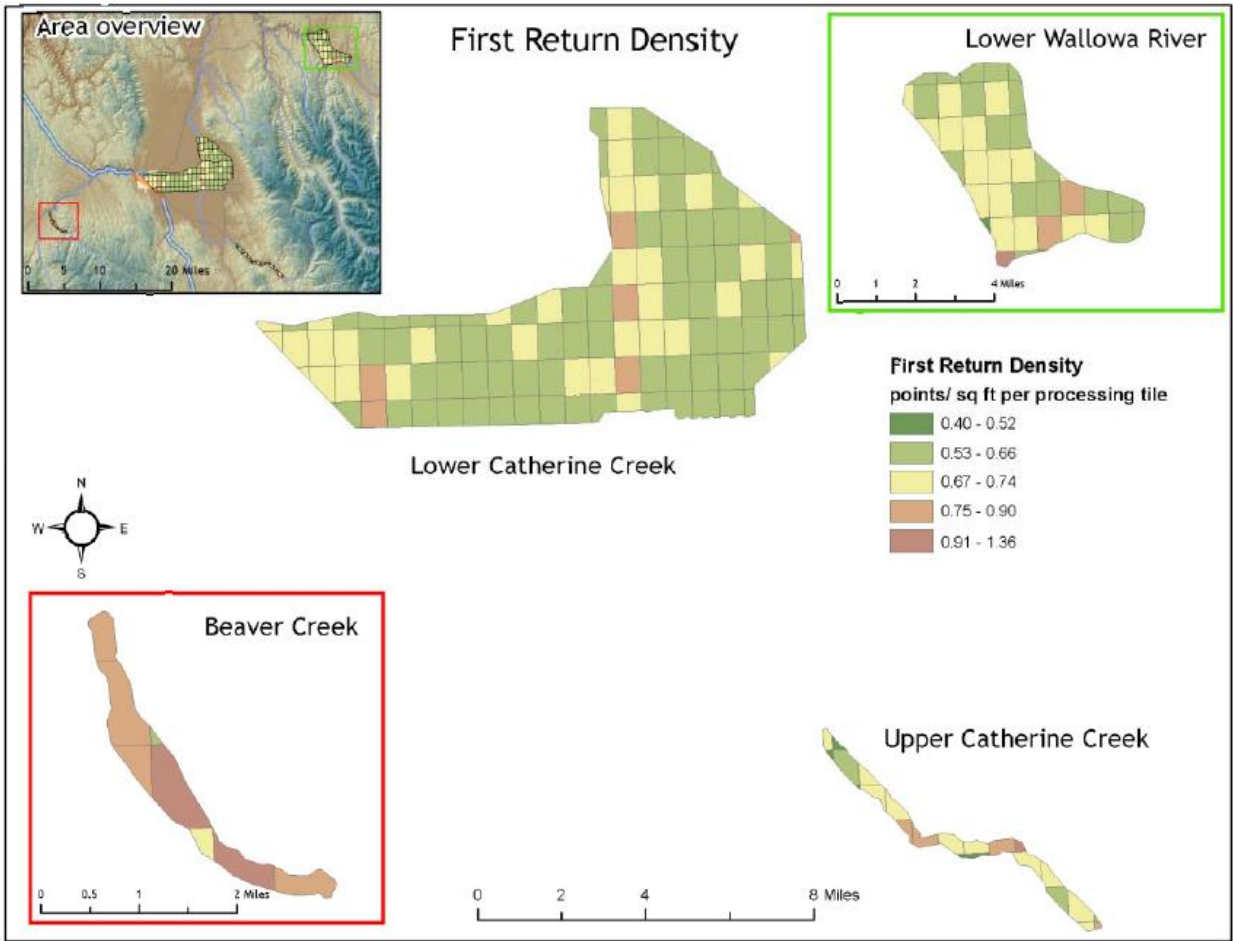**Figure 1: Project Area, note highlighted projects are the only ones for which data was received for this project.**
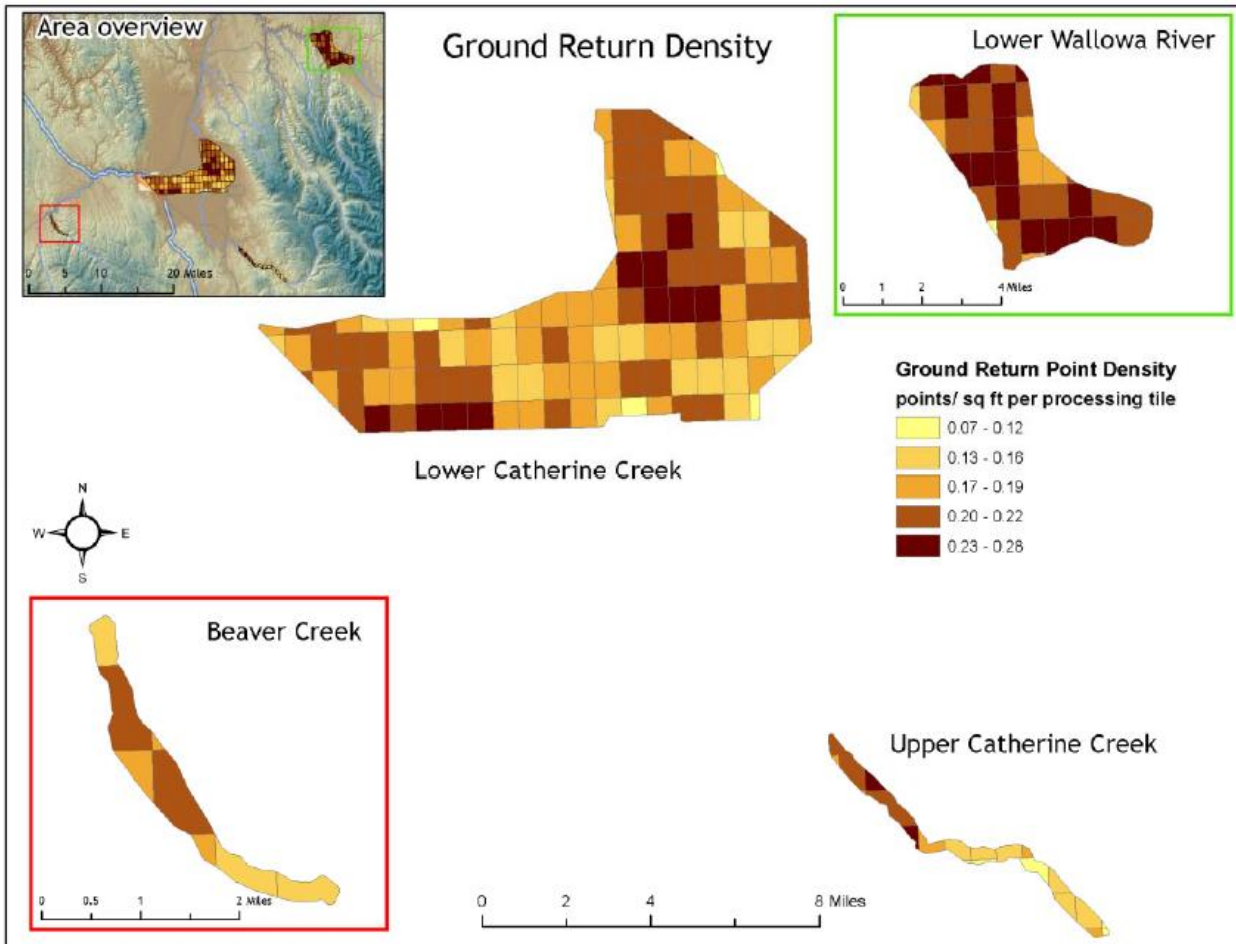
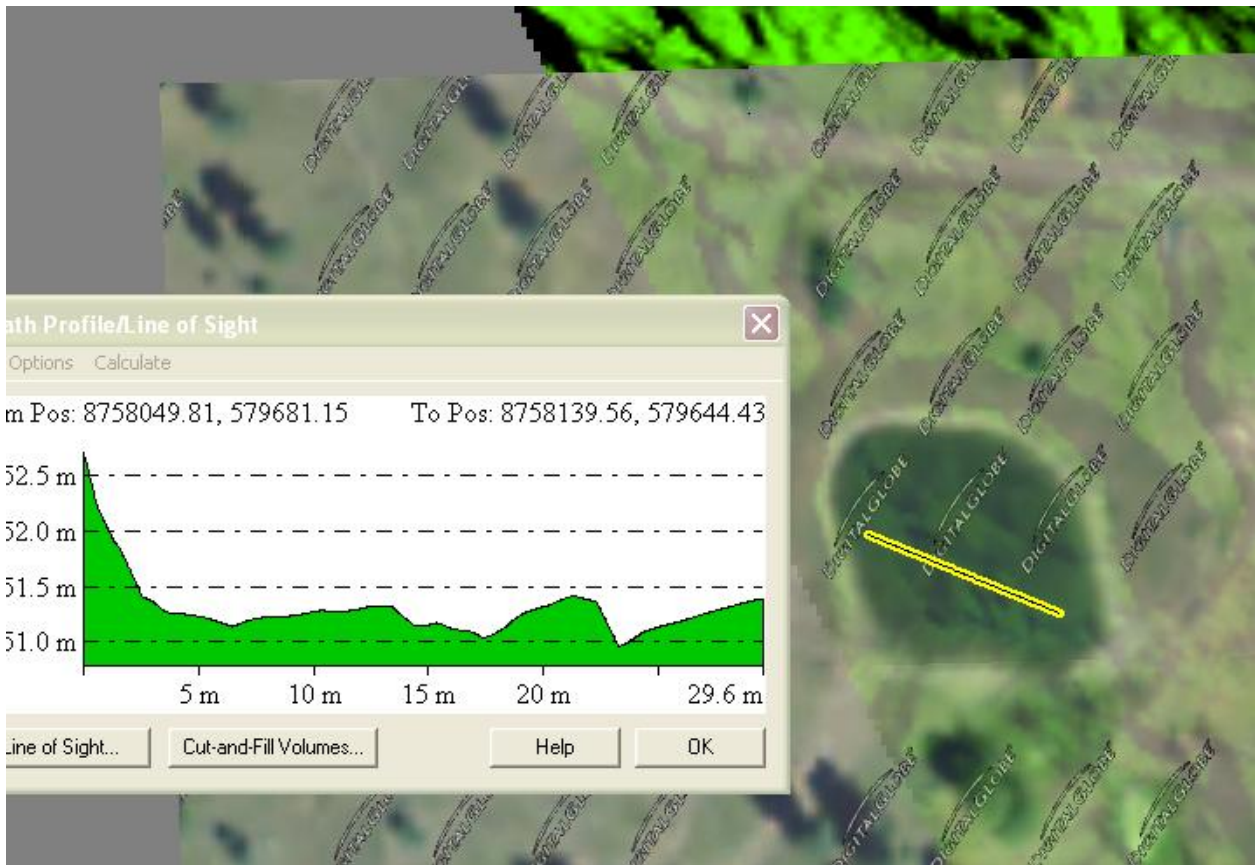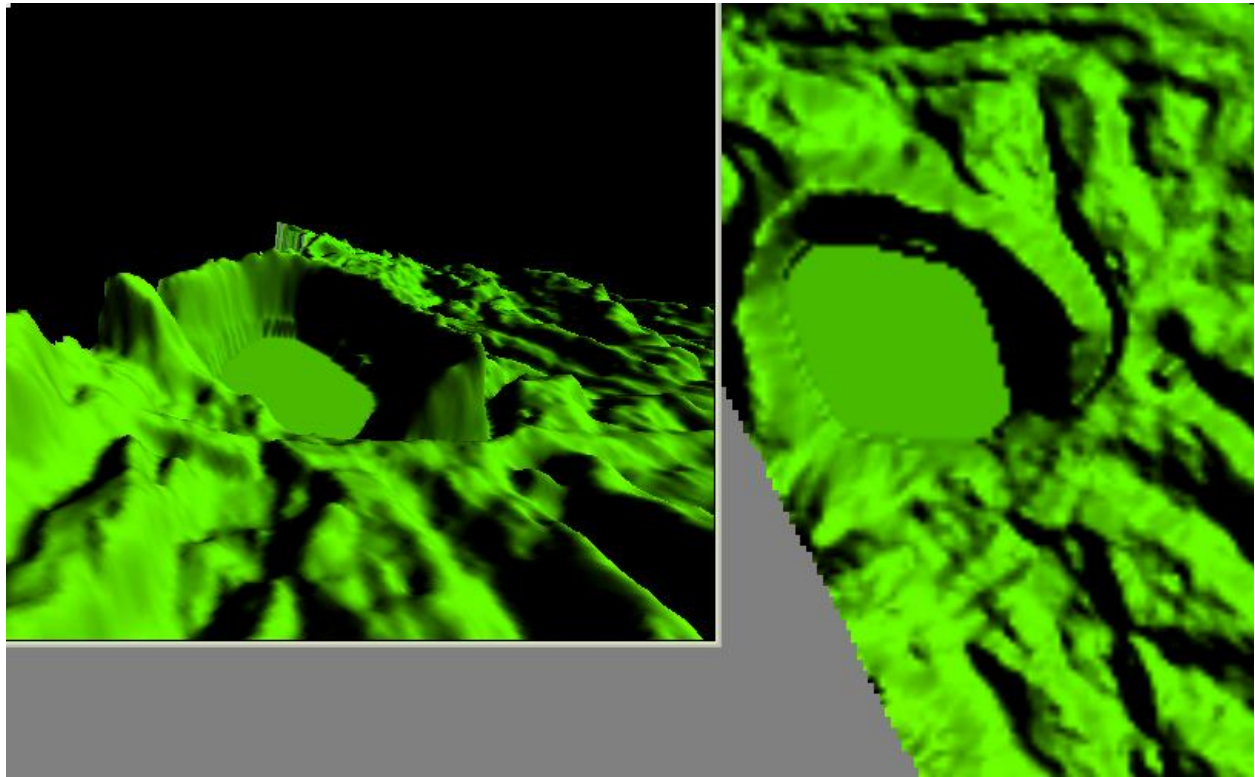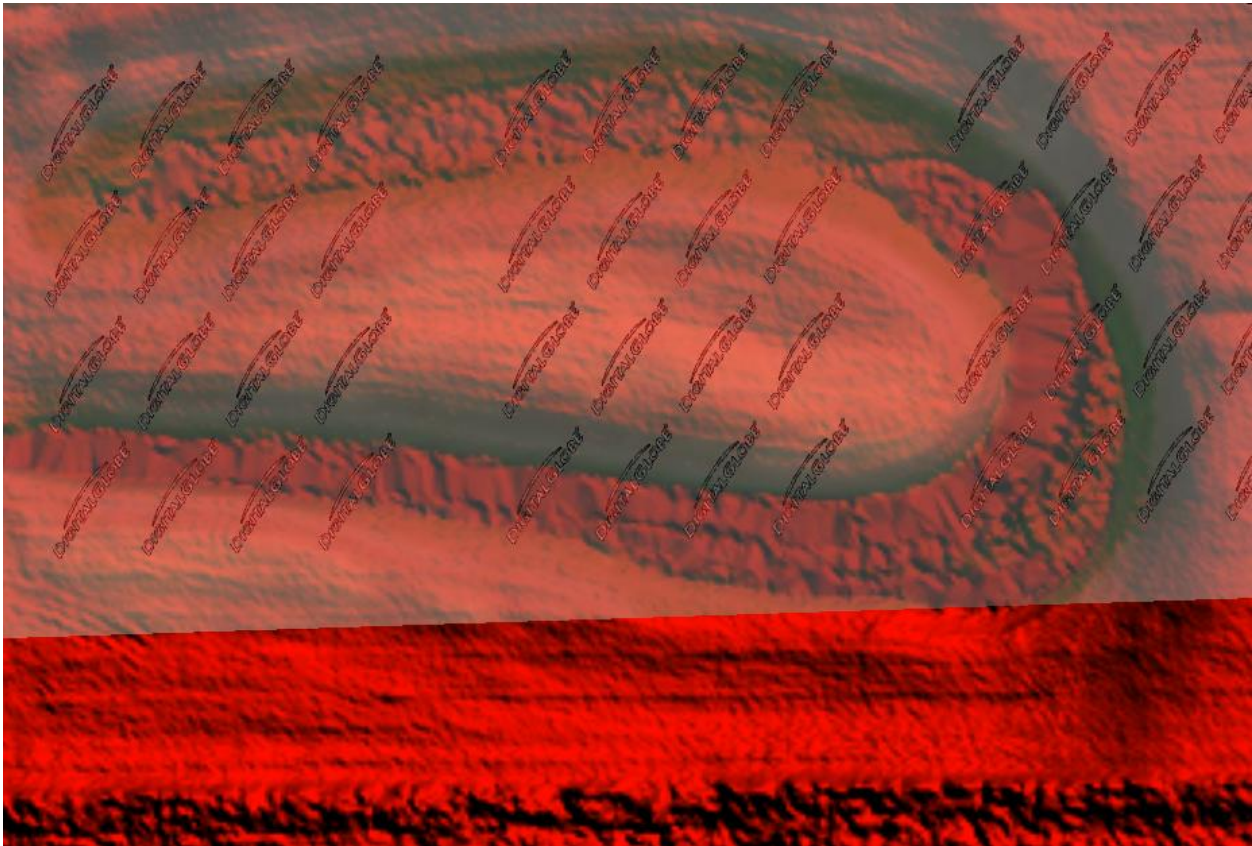**Figure 2: 1st Return Density Estimates**



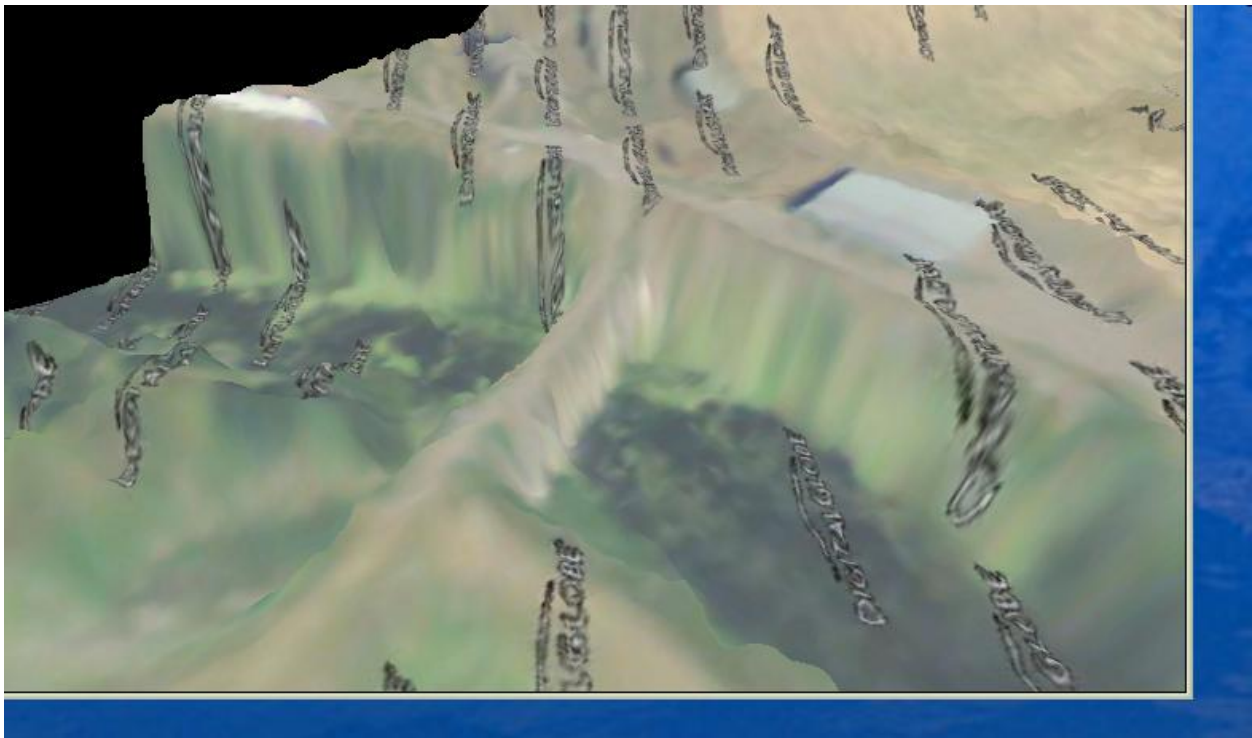**Figure 3: Ground Return Density Estimates**

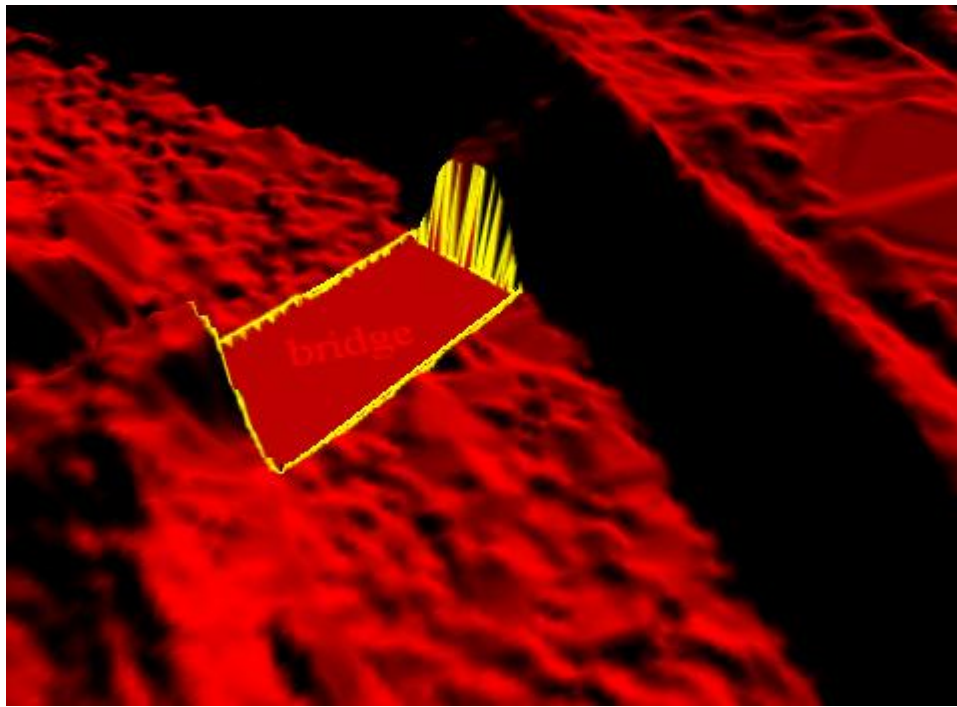**Figure 4: Example of waterbody not leveled.**



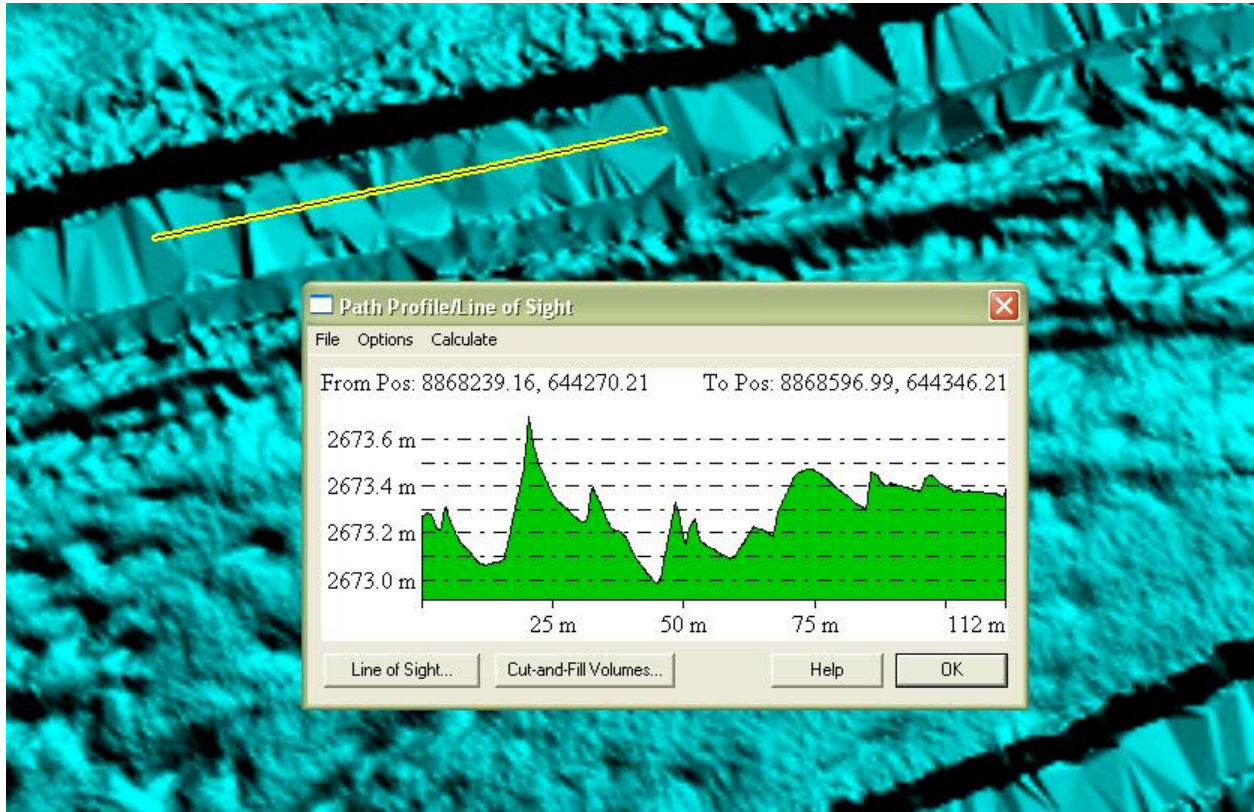**Figure 5: Manually Leveled Waterbody**

**Figure 6: Example oxbow Lake not leveled.**


**Figure 7: Example Bridge not removed**

**Figure 8: Removed Bridge**



**Figure 9: Effects of not using breaklines on double line streams**