WROC 2015 - Douglas Co. St. Louis River QL2 LiDAR (2015-16); Project Level

Thumbnail Not Available

Tags
elevation, Lidar, Hydrology

Summary
This data, along with its derivitives, is part of a watershed stressor and habitat assessment in the larger Nemadji River watershed. This data was produced all from lidar information as of 2015.

Description
The St. Louis River Area of Concern project area covers approximately 308 square miles. Lidar data was acquired with a nominal point spacing (NPS) of 0.7 meters . Project specifications are based on the U.S. Geological Survey National Geospatial Program Base LIDAR Specification, Version 1.0. The data was developed based on a horizontal projection/datum of Coordinate System: NAD_1983_UTM_Zone_15N, Meters and vertical datum of NAVD1988 (GEOID12A), Meters.
LiDAR data was acquired using the Orion Optech H300 sensor. Collection occurred from October 17-19, 2015, while no snow was on the ground and rivers were at or below normal levels.

Credits
There are no credits for this item.

Use limitations
None. However, temporal changes to the Earth's surface may have occurred since the acquisition of the lidar data and may no longer represent current bare earth surface conditions.

Extent
There is no extent for this item.

Scale Range
There is no scale range for this item.

ArcGIS Metadata ►

Citation ►

TITLE WROC 2015 - Douglas Co. St. Louis River QL2 LiDAR (2015-16); Project Level

Hide Citation ▲

Resource Details ►

CREDITS

Hide Resource Details ▲

Resource Constraints ►

CONSTRAINTS
LIMITATIONS OF USE

None. However, temporal changes to the Earth's surface may have occurred since the acquisition of the lidar data and may no longer represent current bare earth surface conditions.

Hide Resource Constraints ▲

FGDC Metadata (read-only) ▼

CITATION
CITATION INFORMATION
ORIGINATOR Ayres Associates
PUBLICATION DATE unknown
TITLE
WROC 2015 - Douglas Co. St. Louis River QL2 LiDAR (2015-16); Project Level
PUBLICATION INFORMATION
PUBLICATION PLACE Madison, WI
PUBLISHER Ayres Associates

DESCRIPTION
ABSTRACT
The St. Louis River Area of Concern project area covers approximately 308 square miles. Lidar data was acquired with a nominal point spacing (NPS) of 0.7 meters . Project specifications are based on the U.S. Geological Survey National Geospatial Program Base LIDAR Specification, Version 1.0. The data was developed based on a horizontal projection/datum of Coordinate System: NAD_1983_UTM_Zone_15N, Meters and vertical datum of NAVD1988 (GEOID12A), Meters.
LiDAR data was acquired using the Orion Optech H300 sensor. Collection occurred from October 17-19, 2015, while no snow was on the ground and rivers were at or below normal levels.
PURPOSE
This data, along with its derivitives, is part of a watershed stressor and habitat assessment in the larger Nemadji River watershed. This data was produced all from lidar information as of 2015.
TIME PERIOD OF CONTENT
TIME PERIOD INFORMATION
RANGE OF DATES/TIMES
BEGINNING DATE 2015-10-17
ENDING DATE 2015-10-19
CURRENTNESS REFERENCE
ground condition
STATUS
PROGRESS Complete
MAINTENANCE AND UPDATE FREQUENCY None planned

SPATIAL DOMAIN
BOUNDING COORDINATES
WEST BOUNDING COORDINATE -92.299251
EAST BOUNDING COORDINATE -91.862322
NORTH BOUNDING COORDINATE 46.752570
SOUTH BOUNDING COORDINATE 46.319511

KEYWORDS

THEME
THEME KEYWORD THESAURUS None
THEME KEYWORD elevation
THEME KEYWORD Lidar
THEME KEYWORD Hydrology

PLACE
PLACE KEYWORD THESAURUS None
PLACE KEYWORD Wisconsin
PLACE KEYWORD Douglas County
PLACE KEYWORD St. Louis River Area of Concern

ACCESS CONSTRAINTS
Any and all accessibility to data of or pertaining to the 2016 lidar dataset is to be determined by the Wisconsin Department of Natural Resources.

USE CONSTRAINTS
None. However, temporal changes to the Earth's surface may have occurred since the acquisition of the lidar data and may no longer represent current bare earth surface conditions.

POINT OF CONTACT
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NATIVE DATA SET ENVIRONMENT
Environment as of Metadata Creation: Microsoft Windows 7 Version 6.1 (Build 7601) Service Pack 1; Esri ArcGIS 10.3.1 (Build 4959) Service Pack N/A (Build N/A)

Hide Identification ▲

ATTRIBUTE ACCURACY
ATTRIBUTE ACCURACY REPORT
No formal attribute accuracy tests were conducted.

LOGICAL CONSISTENCY REPORT
Spatial consistency of coverage of the 2016 St. Louis River Area of Concern project area was maintained throughout the dataset.

COMPLETENESS REPORT
Spatial consistency of coverage of the 2016 St. Louis River Area of Concern project area was maintained throughout the dataset.

POSITIONAL ACCURACY
HORIZONTAL POSITIONAL ACCURACY
HORIZONTAL POSITIONAL ACCURACY REPORT
A formal accuracy assessment of the horizontal positional information in the data set has not been conducted.

VERTICAL POSITIONAL ACCURACY
VERTICAL POSITIONAL ACCURACY REPORT

Specifications for this project require that independent checkpoints are used to test the vertical accuracy of the point cloud and DEM. The point cloud specification to be met is 19.6 cm or better at the 95% confidence level for Nonvegetated Vertical Accuracy (NVA) points. The DEM specification to be met is 19.6 cm or better at the 95% confidence level for NVA points, and 29.4cm or better at the 95th percentile for Vegetated Vertical Accuracy (VVA) points. The point cloud was tested against 25 NVA checkpoints, and reported 6.1 cm at the 95% confidence level. The DEM was tested against 25 NVA checkpoints and 20 VVA checkpoints. The DEM test results were 6.4cm at the 95% confidence level for NVA land cover types, and 28.1cm at the 95th percentile for VVA land cover types.

LINEAGE

SOURCE INFORMATION

SOURCE CITATION

CITATION INFORMATION

ORIGINATOR Ayres Associates

PUBLICATION DATE 2016

TITLE

St Louis River Ground Control Report

GEOSPATIAL DATA PRESENTATION FORM survey

PUBLICATION INFORMATION

PUBLICATION PLACE Madison, WI

PUBLISHER Ayres Associates

TYPE OF SOURCE MEDIA Digital and/or Hardcopy Resources

SOURCE TIME PERIOD OF CONTENT

TIME PERIOD INFORMATION

SINGLE DATE/TIME

CALENDAR DATE 2015

SOURCE CURRENTNESS REFERENCE

ground condition

SOURCE CITATION ABBREVIATION

St Louis River Ground Control Report

SOURCE CONTRIBUTION

This data source was used (along with the airborne GPS/IMU Data) to aid in the georeferencing of the lidar point cloud data.

PROCESS STEP

PROCESS DESCRIPTION

Lidar Pre-Processing:

The following specifications are checked against the actual data collection and quality results:

- Nominal Pulse Spacing (NPS), or point density and points per square meter (PPSM) for first return data.
- Spatial distribution of points is uniform and free from clustering.
- Flight planning and data acquired cover the entire project boundary.
- Multiple returns from any given pulse are stored in order and point families remain intact.
- Each return includes: easting, northing, elevation, intensity, order of return (i.e. first-return, second-return), classification, GPS week, GPS second. Easting, northing, and elevation must be recorded to the nearest 0.01 meter and GPS second reported to the nearest microsecond (or better). May include additional attributes but no duplicate entries.
- Minimum 30% overlap on adjoining swaths.
- No voids between swaths.
- Must be cloud, smoke, dust, and fog-free between the aircraft and ground.

• At least two (2) GPS reference stations in operation during all missions, sampling positions at 1 Hz or higher frequently. Differential GPS baseline lengths shall not exceed 30 km. Differential GPS unit in aircraft shall sample position at 2 Hz or more frequently.

After our technicians establish the smoothed best estimate of trajectory (SBET), they apply the solution to the dataset in order to adjust each point based on aircraft position and orientation during LiDAR acquisition. To correct angular misalignments (roll, pitch, and heading errors), a manual bore sight calibration is employed before each day's mission to fine-tune the bore sight angles. It is at this point, as part of our LiDAR QA/QC procedure, that a review of the mission logs and mission parameters are performed.

PROCESS DATE Unknown

PROCESS STEP

PROCESS DESCRIPTION

LAS Point Cloud Classification:

LiDAR data processing for the point cloud deliverable consists of classifying the LiDAR using a combination of automated classification and manual edit/reclassification processes. On most projects the automated classification routines will correctly classify 90-95% of the LiDAR points. The remaining 5-10% of the bare earth ground class must undergo manual edit and reclassification.

Because the classified points serve as the foundation for the Terrain, DEM and breakline products, it is necessary for the QA/QC supervisor to review the completed point cloud deliverables prior to the production of any additional products.

The following workflow steps are followed for automated LiDAR classification:

1. Lead technicians review the group of LiDAR tiles to determine which automated classification routines will achieve the best results. Factors such as vegetation density, cultural features, and terrain can affect the accuracy of the automated classification. The lead technicians have the ability to edit or tailor specific routines in order to accommodate the factors mentioned above, and achieve the best results and address errors.
2. Distributive processing is used to maximize the available hardware resources and speed up the automated processing as this is a resource-intensive process.
3. Once the results of the automated classification have been reviewed and passed consistent checks, the supervisor then approves the data tiles for manual classification.

The following workflow steps are followed for manual edits of the LiDAR bare earth ground classification:

1. LiDAR technicians review each tile for errors made by the automated routines and correctly address errors any points that are in the wrong classification. By methodically panning through each tile, the technicians view the LiDAR points in profile, with a TIN surface, and as a point cloud.
2. Any ancillary data available, such as Google Earth, is used to identify any features that may not be identifiable as points so that the technician can make the determination to which classification the feature belongs.

The QA/QC processes for the LiDAR processing phase consist of:

1. The lead technician reviews all automated classification results and adjust the macros as necessary to achieve the optimal efficiency. This is an iterative process, and the technician may need to make several adjustments to the macros, depending upon the complexity of the features in the area being processed.

2. During the manual editing process, the LiDAR technicians use a system of QA, whereby they check each other's edits. This results in several benefits to the process:
3. There is a greater chance of catching minor blunders
4. It increases communication between technicians on technique and appearance
5. Solutions to problems are communicated efficiently
6. To ensure consistency across the project area, the supervisor reviews the data once the manual editing is complete.

For this phase of a project, the following specifications are checked against:

- Point cloud – all points must be classified according to the USGS classification standard for LAS. The all-return point cloud must be delivered in fully-compliant LAS version 1.2.
- LAS files will use the Spatial Reference Framework according to project specification and all files shall be projected and defined.
- General Point classifications:
  - Class 1. Processed, but unclassified
  - Class 2. Bare-earth Ground
  - Class 7. Low Point (Noise)
  - Class 9. Water
  - Class 10. Ignored ground (Breakline proximity)
  - Class 11. Withheld
  - Class 17. Bridge Decks
  - Class 18. High Point (Noise)
- Outliers, noise, blunders, duplicates, geometrically unreliable points near the extreme edge of the swath, and other points deemed unusable are to be identified using the "Withheld" flag. This applies primarily to points which are identified during pre-processing or through automated post-processing routines. Subsequently identified noise points may be assigned to the standard Noise Classes (Class 7 or Class 18).
- Point classification shall be consistent across the entire project. Noticeable variations in the character, texture, or quality of the classification between tiles, swaths, lifts, or other non-natural divisions will be cause for rejection.
- Once the data is imported into GeoCue and has undergone and passed the QC process, the strip data will be tiled to the 5000' x 5000' tiling scheme.

PROCESS DATE unknown

PROCESS STEP

PROCESS DESCRIPTION

Breaklines:

Once the classified point clouds have been reviewed and approved, the LiDAR can be used to generate the hydro-flattening breaklines. Once the breaklines are developed, they will also be used to hydro-enforce ESRI Terrains and Digital Elevation Model (DEM) products.

The following process steps are used to generate hydro-flattening breaklines:
1. The technician visualizes the LiDAR point cloud by intensity.
2. The technician then creates the hydro-breaklines using Terrasolid software, as well as ancillary sources (such as Google Earth) as a reference in areas where the features appear ambiguous.
3. Once the breaklines are completed, they are separated into layers containing polygonal breaklines and line features.
4. To further differentiate the type of water, the polygonal breaklines are then separated or classified as ponded water or flowing water.

5. Flowing water: Using downhill conflation rules, stream and river centerlines are digitized to enforce the hydrological representation of water flow. Once this is done, polygons are digitized to represent the stream or river banks. The elevation from the steam centerlines are then applied to the polygons so that each side of the bank has the same elevation.
6. Ponded water: is digitized using Terrasolid's conflation rule. Terrasolid determines the average elevation of the water represented by the polygon, conflates the breakline, and then classifies the LiDAR points inside of the polygon to water.
7. Breaklines representing ponds and rivers will be smooth and continuous, and monotonic, and represent the water surface without any stair steps except for dams and rapids.
8. The breaklines are then converted to the product deliverable format The product undergoes QC by the supervisor and is reviewed for any omissions or blunders.

For this phase of the project, the following Statement of Work specifications are checked against:

- All breaklines developed for use in hydro-flattening shall be delivered as a non-tiled Esri feature class for the project area and/or polyline shapefile or geodatabase format. Water bodies (ponds, lakes, and reservoirs), wide streams and rivers ("double-line"), and other non-tidal water bodies are to be hydro-flattened within the DEM, resulting in a flat and level bank-to-bank gradient. The entire water surface edge must be at or below the immediately surrounding terrain.
- Breakline feature class will use the Spatial Reference Framework according to project specifications and shall be projected and defined.
- Hydro-flattening shall be applied to all streams that are nominally wider than 20 feet, and to all non-tidal boundary waters bordering the project area regardless of size.
- Hydro-flattening shall be applied to all water impoundments, natural or man-made, that are nominally larger than 2 acres in area (equivalent to a round pond ~350' in diameter).
- Stream channels should break at road crossings (culvert locations). These road fills should not be removed from the DEM. However, streams and rivers should NOT break at elevated bridges. Bridges should be removed from the DEM (see 'Artifacts' under Bare Earth LiDAR/DEM Raster). When the identification of a feature such as a bridge or culvert cannot be made reliably, the feature should be regarded as a culvert.

PROCESS DATE unknown

PROCESS STEP

PROCESS DESCRIPTION

Surface Models and Intensity Images:

Digital Elevation Model (DEM)

A bare earth DEM will be provided for this project. To develop that dataset, the TIN's surface is referenced to determine the elevation for a highly dense set of points. The point sets will then be divided into cells. Each cell's elevation will then be determined by an average of all the elevations sampled within its extent. The DEM cell size is 3.125 feet, such that the cells will exactly match the boundaries of each tile.

This process will be carried out for large overlapping blocks across the project area. The blocks will overlap to ensure consistency. After the project wide DEM dataset has been created, the large DEM files will be cut up into tiles based on the tiling scheme file and exported to ESRI Grid files or another format if preferred.

Once the DEM is created, visual inspection in Global Mapper is performed for artifacts (tension lines, voids, edge effects) and for hydro-enforcement of waterbody, hydrographic, island and soft features. If any artifacts appear in the DEM, the point sets will be reviewed to determine the cause of the problem. In addition, visual inspection will be performed on the DEM using Global Mapper and LP360 looking for floating breaklines in the surface.
Lastly, the DEM is inspected using Global Mapper and LP360 for .LAS filtering consistency, any remaining systematic issues, and to ensure vegetation has been removed from the surface.
Visual inspection is performed in Global Mapper to identify any data voids and pixel gaps. Global Mapper is also used to check GeoTIFF header information to ensure the projection information is applied to each image correctly.
PROCESS DATE unknown

PROCESS STEP
PROCESS DESCRIPTION
Contour Generation:
Once all other base deliverable products have undergone the QA/QC process, the 1-foot contour data set will be prepared.
Model keypoints are generated as a subset of the bare earth surface. Model keypoints are files derived from the bare earth ground points using an intelligent data decimation algorithm. The algorithm works by thinning out the data in areas of little relief while keeping more points near breaks and variations in terrain. More information is retained using this method than compared to using a regularly-spaced grid, yet the process results in more manageable file sizes.
The hydro-flattened breaklines in combination with the model keypoints will be used to generate 1-foot contours. All contours products will be produced using a combination of Terrasolid's TerraModeler and ESRI ArcGIS software and exported to AutoCAD and ESRI formats for delivery.
PROCESS DATE unknown

Hide Data Quality ▲
HORIZONTAL COORDINATE SYSTEM DEFINITION
PLANAR
MAP PROJECTION
MAP PROJECTION NAME NAD 1983 UTM Zone 15N
TRANSVERSE MERCATOR
SCALE FACTOR AT CENTRAL MERIDIAN 0.9996
LONGITUDE OF CENTRAL MERIDIAN -93.0
LATITUDE OF PROJECTION ORIGIN 0.0
FALSE EASTING 500000.0
FALSE NORTHING 0.0

PLANAR COORDINATE INFORMATION
PLANAR COORDINATE ENCODING METHOD coordinate pair
COORDINATE REPRESENTATION
ABSCISSA RESOLUTION 0.0000000002220024164500956
ORDINATE RESOLUTION 0.0000000002220024164500956
PLANAR DISTANCE UNITS meter

GEODETIC MODEL
HORIZONTAL DATUM NAME D North American 1983
ELLIPSOID NAME GRS 1980
SEMI-MAJOR AXIS 6378137.0

DENOMINATOR OF FLATTENING RATIO 298.257222101

Hide Spatial Reference ▲

DISTRIBUTOR
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METADATA DATE 2016-07-07
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METADATA STANDARD NAME FGDC Content Standard for Digital Geospatial Metadata
METADATA STANDARD VERSION FGDC-STD-001-1998

Hide Metadata Reference ▲