LiDAR Topography Survey – Lower Hatchie NWR and Hatchie NWR

FY 2011

PROJECT DESCRIPTION

Airborne modeling data were collected in the form of Laser-scan (LiDAR) and color digital imagery (digital aerial photography) at Lower Hatchie NWR and Hatchie NWR.

Airborne light detection and ranging (LiDAR) technology is an active remote sensing technology which allows accurate measurements of topography and vegetation canopy heights allowing refuge staffs to establish baseline topographical information to monitor effects of changing landscapes due to changes in weather patterns, flood patterns, siltation, hydrology patterns, wild-land urban interfaces, and adjacent farming activities over time. The primary objective of this project is to acquire and process high resolution airborne LiDAR data for the construction of a detailed topographic surface and elevation contours of the refuges.

Completion of this project provides the necessary data to further all habitat management, wildlife and land acquisition goals outlined in the refuge's Comprehensive Conservation Plan, Gulf Coastal Plains and Ozarks Landscape Conservation Cooperative, the West Tennessee Resources Conservation Plan area, and other national initiatives. The LiDAR acquired data allow for conservation projects to be strategically located and applied by using science as the underpinning for the refuge's future management decisions.

OBJECTIVES AND ALTERNATIVES

The objective was to acquire and process high resolution airborne LiDAR data for the construction of a detailed surface model and elevation contours of the refuges. This highly accurate topographical information will be utilized to monitor water quality and in the restoration, management, and development of highly productive wetland systems as well as reestablish bottomland hardwood forest to meet the goals and objectives of Hatchie NWR and Lower Hatchie NWR CCP's, Lower Mississippi Valley Joint Venture, Gulf Coastal Plains and Ozarks LCC, and the West Tennessee Wildlife Resources Conservation Plan.

This baseline information will give refuge managers the ability to monitor topographical changes due to accelerated climate change and threats from environmental stressors over time. This project will provide the needed knowledge to monitor changes in topography which drives changes in water quality due to siltation. This has a direct impact on the loss of wetlands and bottomland hardwood forests in west Tennessee.

METHODS AND PROTOCOLS

Contractor provided better than 10-cm accuracy and greater than 1 meter nominal point spacing for the entire Lower Hatchie NWR and Hatchie NWR area (~25,000 acres). The vertical accuracies supported the development of one foot contours according to National Map Accuracy Standards and FEMA standards. The RMSE for the vertical accuracy was 10cm or better in flat terrain and 20cm or better in hilly terrain.

The QC process included removing anomalies, extracting miscellaneous non-bare earth features, conducting an accuracy assessment, and an overall qualitative assessment. The final polished point cloud provided a refined and extremely accurate dataset for the generation of a highly detailed surface model and elevation contours. Horizontal datum and vertical datum were specified by the Refuges. LiDAR tied into the "refuge" datums.

The Contractor used the data deliverables to produce one foot contours, 2ft raster DEM and DSM data, as well as other ESRI friendly products (i.e., hill-shade, intensity image) of potential use for the entire refuges (~25,000 acres). Contractor delivered the Triangulated Irregular Networks (TINs) and raster Digital Elevation Models (DEMs) of the land portions of the Refuge to better accommodate an ArcGIS environment based on the USFWS preference.

Raw pre-processed LiDAR data set in ASCII format (unclassified) with formatting for import into ESRI ArcMap if desired

- Post-processed LiDAR data set in ASCII and LAS formats (classified into 1st return, last return, and bare earth) with formatting for import into ESRI ArcMap
- A digital terrain model of the bare earth for the project area conforming to a minimal 2 foot by 2 foot on-ground pixel size with an associated elevation.
- Ground control report and accuracy assessment
- 1 foot elevation contours in shapefile format
- TIN or Terrain data
- 2 ft raster DEM
- 2 ft raster DSM
- 2 ft hill-shade raster
- 2 ft intensity image raster
- Control points in shapefile format
- Breadlines' in shapefile format (if necessary)
- All pertinent metadata

DATA MANAGEMENT

All pertinent metadata and all digital data were delivered on an external hard drive. This external hard drive is stored in a safe at the West Tennessee NWR Complex Headquarters.

DATA ANALYSIS / MODELS

Data will be entered by Wildlife Refuge Managers, Wildlife Biologist, and the Supervisory/Lead Forester.

Data was analyzed by the GPS specific software that was delivered as part of the package, and was synthesized by refuge staff upon completion of data collection.

ACCOMPLISHMENTS AND MANGEMENT IMPLICATIONS

Completion of this project provides the necessary data to further all habitat management, wildlife and land acquisition goals outlined in the refuges' Comprehensive Conservation Plan, Gulf Coastal Plains and Ozarks Landscape Conservation Cooperative, the West Tennessee Resources Conservation Plan area, and other local, regional, and national initiatives. The LiDAR acquired data allows for quality conservation practices to be strategically located and applied using science as the underpinning for the refuges' future management decisions. This project is complete and refuge staff have already utilized the data provided in both wetland and forestry improvement projects.

MORE INFORMATION

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