

# RS R&D – Aerial LiDAR Software

(page 1 of 3)

- The data:
  - MD, OH, and PA already have state-wide data and derived products; others to follow.
  - Many engineering and aerial photography firms offer LiDAR besides traditional surveys.
  - 360-degree mine void data from cavity scanners are coming.
- The value:
  - The data are accurate and precise.
  - They capture everything in stunning detail: trees, cars, buildings, bare ground, etc., including SMCRA issues like subtle drainage patterns, landslides, subsidence features, etc.
  - They provide exquisite “baseline” conditions against which subsequent SMCRA issues can be compared.
- The problems:
  - Derived products (shapefiles, CAD drawings, DEMs) are interpreted, fine details are lost.
  - “In-house” processing of raw data is only way to preserve SMCRA-related details.
  - Raw datasets are huge: >1,000,000 points/square mile and beyond capability of most TIPS software.
- The R&D Challenge:
  - Evaluate Windows-based software for Aerial LiDAR data processing, editing, and modeling.

# RS R&D – Aerial LiDAR Software

(page 2 of 3)

- Test guidelines for candidate software:
  - Focus on Aerial LiDAR; test on mine void point clouds if possible.
  - Must run on Windows as standalone or as “plug-in” to existing TIPS software.
  - Ease of use: Straightforward user interaction with uncomplicated command-line and/or intuitive interface; user can focus on data editing and modeling – not software “quirks.”
  - Robust 3D editing.
  - Integral modeling (for standalone or by host software if a plug-in) and/or standard data exchange to other TIPS software.
  - While not essential, any classification tools must be flexible for SMCRA conditions; canopy segregation for habitat and reclamation/reforestation assessment a definite plus.
  - Categories/Weighting: >\$14,000 “total solution;” ~\$5,000 plug-in/standalone under liberal floating license, ~\$1,000 for standalone; truly free (in the Public Domain) and readily work with TIPS software; already exist within TIPS software.
- Testing:
  - Of about 32 candidates, 21 were available for testing either as time-limited full or true demo versions; Appalachian Region bought a copy of one package.
  - Platforms:
    - Windows: 2000, XP Home, or XP pro; tester with at least Power User rights.
    - Hardware: 933MHz, 512M; 1.6GHz, 512M; 2.2GHz, 2G; dual 3.3GHz, 4G.
  - Test area/data: 2,300 acres (typical PA tile): suburban-rural == farmland, weedy shrubs, fallow ground, deciduous/coniferous trees (saplings to mature), base-level to rolling headwaters topography (550’ local relief), homes to industrial buildings, SMCRA features (subsidence pits, highwalls, gob, ponds, drainage) from 1920’s to 2006. 3,964,000 raw points in LAS format

# RS R&D – Aerial LiDAR Software

(page 3 of 3)

- Findings:

- “Total solution” LiDAR processing packages were the clear functionality winners but at \$15,000 and up can’t be justified if less robust (preferably part of TIPS already) tools can fill expected needs.
- ~\$5,000 standalone and plug-in packages varied widely in functionality and ease-of-use:
  - LP360 with Classifier for ArcMap (\$4,700 retail, floating) was the best plug-in tested. Editing and multiple views help the user pick bare ground points; no data is lost.
  - LiDAR Analyst (plug-in for ArcMap and IMAGINE) converts LAS data to raster data during import; all 3D detail and value is lost through averaging; TIPS has an educational license but should drop it.
  - Carlson PointClouds (\$5,000) plug-in for AutoCAD Map kept crashing until the dataset was thinned to 800,000 points. 3D editing of the reduced dataset was impossibly slow. PointClouds may have value for tripod-LiDAR but is unsuitable for aerial LiDAR
  - Others: Lots of claims and marketing literature but none are ready for full release.
- <\$1,000, Public Domain/Free, Existing:
  - LiDAR Tools for ENVI – a free plug-in for ENVI. TIPS has a copy of ENVI but it was not available for testing.
  - TIFFs standalone (\$800) – No 3D editing but has powerful tools for segregating canopy from bare ground and producing XYZ tables of tree height and crown diameter.
  - US Forest Service (free)– 1) FUSION: standalone interface and command-line tools that also target canopy discrimination; 2) mcc.aml – a robust minimum-curvature macro for ArcInfo Workstation.
  - Command line tools from LIBLAS.org, UNC, and others – extremely efficient and powerful; indispensable for converting LAS to ASCII as many programs require.
  - EarthVision – only software in TIPS that allows true and efficient 3D editing.

- Recommendations:

- Existing and freely-available software is adequate for majority of users
- Investigate ENVI LiDAR Tools