LiDAR Research & Education Subcommittee
Meeting Minutes
September 3, 2013, 2:00 – 3:30 p.m.

Attendees: Sean Vaughn, Matthew Baltes, Les Everett, Tom Hollenhorst, Steve Kloiber, Colin Lee, Tim Loesch, Grit May, Joel Nelson, Tom Pearson, Nancy Rader, Mark Reineke, Chris Sanocki

Duluth Collection and Change Analysis Grid Issues

Tim described an issue that DNR Parks and Trails staff have reported while using the difference grid created to compare LiDAR data collected before and after the 2012 spring floods in the Duluth area. The grid shows, in some areas, a pattern of deposition on south slopes and of erosion on north slopes in Jay Cooke State Park which does not appear to reflect actual ground conditions. The pattern may be the result of a technical problem, such as the two grids not aligned accurately.

Members discussed possible reasons for the pattern and ways to investigate its possible cause.
- There appears to be a vertical offset of about 3 meters between the hillshades created from each dataset in the area investigated.
- There appears to be a north-south (Y-axis) misalignment in the horizontal direction between the two datasets, at least in some areas – it is not consistent across the grid.
- If the grid shows that deposition is occurring on steep slopes, we know that would be wrong. This would be a possible error check – compare slope values with deposition.
- Where are the flight line changes?
- Could the Topographic Position Index layers be compared?
- Would elevation profiles help show which areas have problems?
- 3-inch imagery collected for Duluth at the same time could possibly be used as another check.
- Could buildings or radio towers be used as fixed reference points to check? No, since LiDAR points don't fall on buildings or towers in the same place. Roads, bridges, railroads are permanent fixtures (more or less) and may work better.
- Might USGS work with measuring other features that move (ice sheets and glaciers) be useful? Not likely.
- USGS has also surveyed some specific areas in Duluth.
- If it is a consistent horizontal offset, that may not be difficult to fix.
- ERDAS georectification may be able to help fix the problem.
- Could spatial regression techniques be used to align the data along known ridgelines?
- If there is a problem with the point cloud, only the vendor can address it; if there is a problem with derived products, state staff can fix.
- The findings so far are preliminary – the problem needs to be validated, quantified and documented.

- The dataset should be kept online, since otherwise people will create their own difference grid which will have the same problem, but it should be flagged. Once we know more about the problem it could be publicized via the MnTOPO portal, LiDAR info webpage, and Minnesota LiDAR Facebook page.

This specific case is an example of a larger issue: in the future, as LiDAR is collected over areas during more than one time period, accurate alignment of the datasets will be critical for accurate detection and assessment of change over time. So far, attention has focused on positional accuracy (horizontal and vertical) of one dataset to real-world ground locations, but not on one dataset to another. So far, Tim hasn't yet found anything in the published literature that addresses this issue. This is not surprising since very few areas of the country have yet had multiple collects.

ACTION ITEM: Tim will investigate the difference grid issues further.

Naming Convention for Elevation Data Files

Members continued discussing filename conventions.

General comments:
- These names help educate users on characteristics of LiDAR data, especially that it's important to know how data was derived.
- Drop any reference to vertical resolution in the filename.
- Keep names under 13 characters for raster data so that processing works well in all situations.
- Use underscores to separate different parts of the filename for ease of coding (when extracting information from a filename).

MOTION: Keep underscores to separate individual elements of a filename. ***Approved.***

More specific comments:
- Topographic Position Index (tpi): Add a parameter indicating the distance selected for the neighborhood analysis.
- Slope: It's important to distinguish between **percent** slope and **degrees** of slope. Propose: **psl** for percent slope, and **dsl** for degrees slope.
- Curvature: There are 3 main methods:
  - Profile
  - Plan
  - A combination of profile and plan, also called "slope shape", that is the standard default in Esri software.
- Contours:

- o Spell out "contours" (don't use "ctr") so not to confuse with "center" or "centroid"
- o 13-character limit not an issue with vector data
- o Should indicate somehow whether or not contours have been smoothed or aggregated. This is an issue when people ask, "what is the accuracy of these contours", for example, when determining ordinary high water levels.
- o "contours02f" would stand for 2-foot contours. The zero is kept so that filenames will sort in order (e.g., 02, 10, 50).
- o Initial proposal to include "_dem_3m" at the end of the filename, indicating that the contours were derived from a 3-meter DEM, was deemed too complicated – this information should be in the metadata.

ACTION ITEM: Double-check Glossary of LiDAR-Related Terms to make sure that all the terms we are using are defined.
ACTION ITEM: Sean will send filenaming proposals to members for further comment.

The discussion will be continued…

Summary of Current Action Items

- Tim will investigate the difference grid issues further.
- Double-check Glossary of LiDAR-Related Terms to make sure that all the terms we are using are defined.
- Sean will send filenaming proposals to members for further comment.

Minutes submitted by Nancy Rader