Integrating Aerial and Ground-based LiDAR in Appalachian Heritage Planning and Visualization

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PROJECT OVERVIEW

Integrating LiDAR and GIS techniques with aerial photography, landscape architecture and archaeological research provides a means to focus on the landscape’s integrity as a meaningful cultural context. This project is a collaborative research project involving the Department of Natural Resources Analysis and the History Department within West Virginia University. The goal is to provide landscape documentation, analysis, planning and visualization of the historic district around the main building at Henderson Hall.

NATIONAL HISTORIC DISTRICT

The Henderson Hall National Historic District contains 14 structures that are significant to the history of the area. The district includes significant buildings that date back to the 18th century and are considered to be among the most important in the nation. The district is located in the vicinity of the Ohio River and encompasses approximately 160 acres.

LANDSCAPE COMPONENT ANALYSIS

LiDAR provides a level of detail not seen before. For this project the existing model for cultural landscape analysis and modeling was developed through an integrated aerial and ground-based LiDAR model.

The overall spatial organization of the property is strongly influenced by vegetation. Property edges where fences were established along the current property boundary. Using aerial LiDAR collected in 2012 and comparing vegetation patterns with 1934 aerial photographs shows a strong correlation between today and the period of significance; and allows for appropriate management strategies in situ development.

The building complex, vegetation plays a similar role in defining streets and creating a strong visual axis. Ground-based LiDAR data, when integrated with the aerial pointcloud allows for three-dimensional visualization of the site landscape. While the 1934 aerial photography does not show enough detail to determine integrity, historic photographs were analyzed to reveal contributing and non-contributing elements.

Conclusions: The integration of aerial and ground-based LiDAR allows researchers to conduct an extensive level of detail for documenting, planning and visualization projects. From the regional scale to the detailed scale the collected data will be used to establish models for cultural landscape research. NRAC will continue to gather, process and apply advanced three-dimensional data to support environmental and heritage planning; on-site archaeology, and visualization simulation efforts. Integrating aerial and ground-based LiDAR in constructing models for the variety of syntheses and visualization efforts is essential to the work. As the Henderson Hall project progresses, demonstrating the interpretive potential of the model will become a key outcome of the project.

References:


Three Adena tumuli are present within the district boundary. These forms are clearly seen in the integrated LiDAR model. Their exact location, dimensions and volume are measurable using the LiDAR. Other archaeological sites identified and located on the site are also discoverable with LiDAR.

Small Scale Features: Integrated ground-based scans accurately located small scale features adjacent to the main hall including a mounting black, stone fence etc. Compressing the detail of these features with historic photography allows researchers to plan for defining these elements in order to improve the spatial significance of the property. Visualizing these changes will be possible within the three-dimensional model.

Archaeological Sites: Three Adena tumuli are present within the district boundary. These forms are clearly seen in the integrated LiDAR model. Their exact location, dimensions and volume are measurable using the LiDAR. Other archaeological sites identified and located on the site are also discoverable with LiDAR.

Figure 7: Tumulus A shown in relation to the main building at Henderson Hall.

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Figure 8: Tumulus A shown in relation to the main building at Henderson Hall.

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Figure 9: Tumulus A shown in relation to the main building at Henderson Hall.

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