PEELING BACK THE LOWCOUNTRY OF SOUTH CAROLINA WITH LIDAR

Presented by:
Jonathan Byham

GPI GEOSPATIAL, INC

PEELING BACK THE LOWCOUNTRY OF SOUTH CAROLINA WITH LIDAR

Multi-disciplined geospatial surveying and mapping branch of Greenman-Pedersen, Inc. (GPI)

- Land Surveying
- Aerial Lidar & Imagery
- Photogrammetry
- Mobile Lidar
- Terrestrial Lidar
- SLAM
- GIS
- SUE

DRAYTON HALL – CHARLESTON, SC

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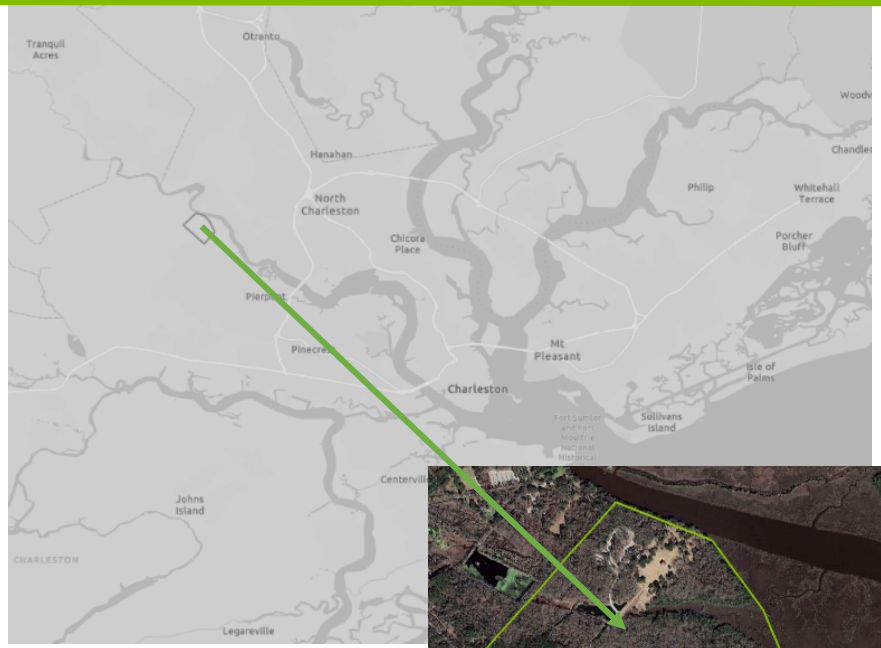

- 18th Century Plantation located within the Ashley River Historic Corridor of Charleston, SC
- 665 acres of a former indigo, rice, and cotton plantation landscape
- Only estate on the Ashley River that survived the Civil War

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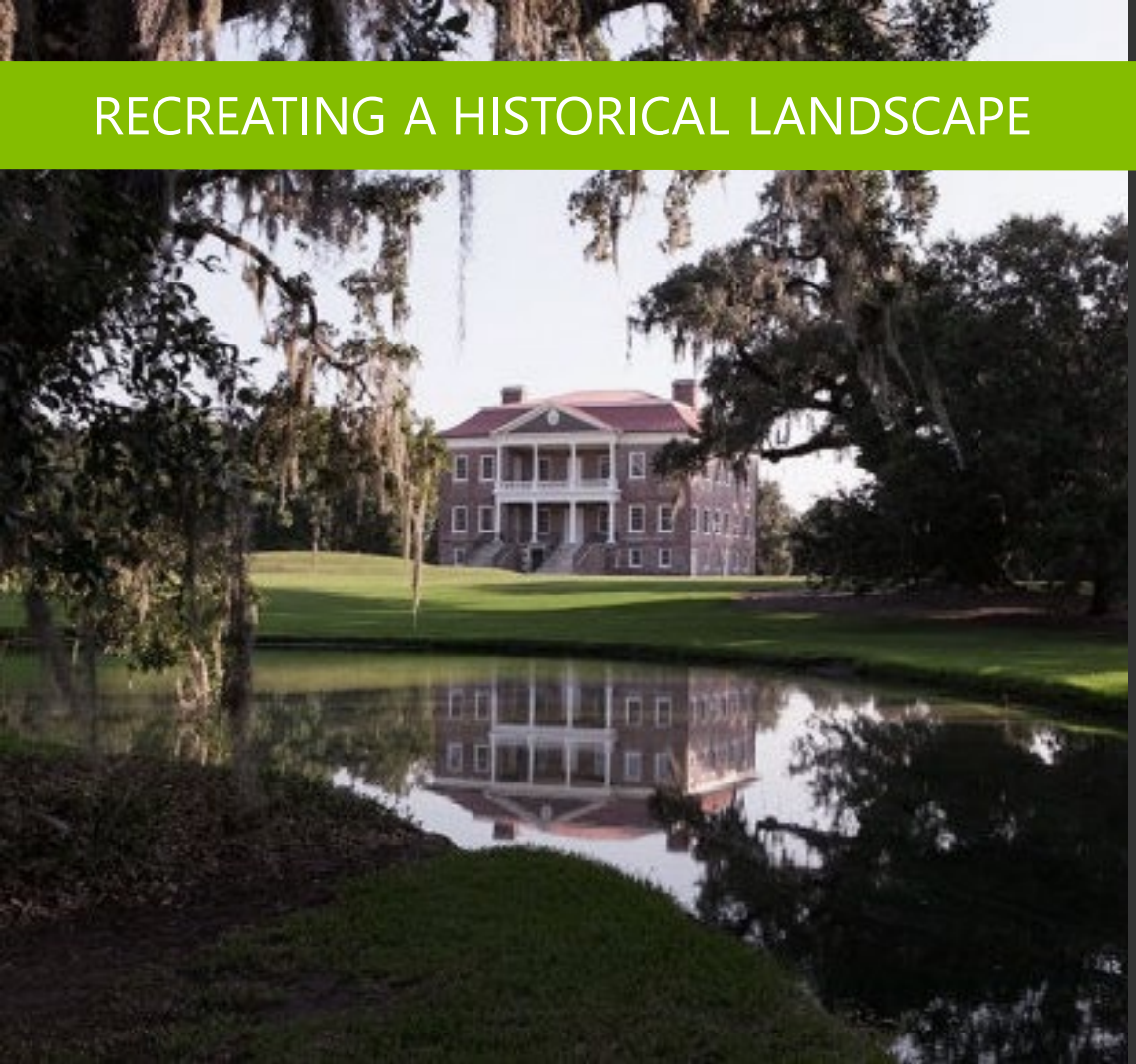
RECREATING A HISTORICAL LANDSCAPE



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- The Drayton Hall property and the entire Ashley River Historic District (ARHD) is a highly sought-after area for historical preservation
- The ARHD is also challenged by climate-driven factors and increased suburban development
- Drayton Hall came to GPI Geospatial to better protect the known and yet-to-be discovered

DRAYTON HALL – CHARLESTON, SC

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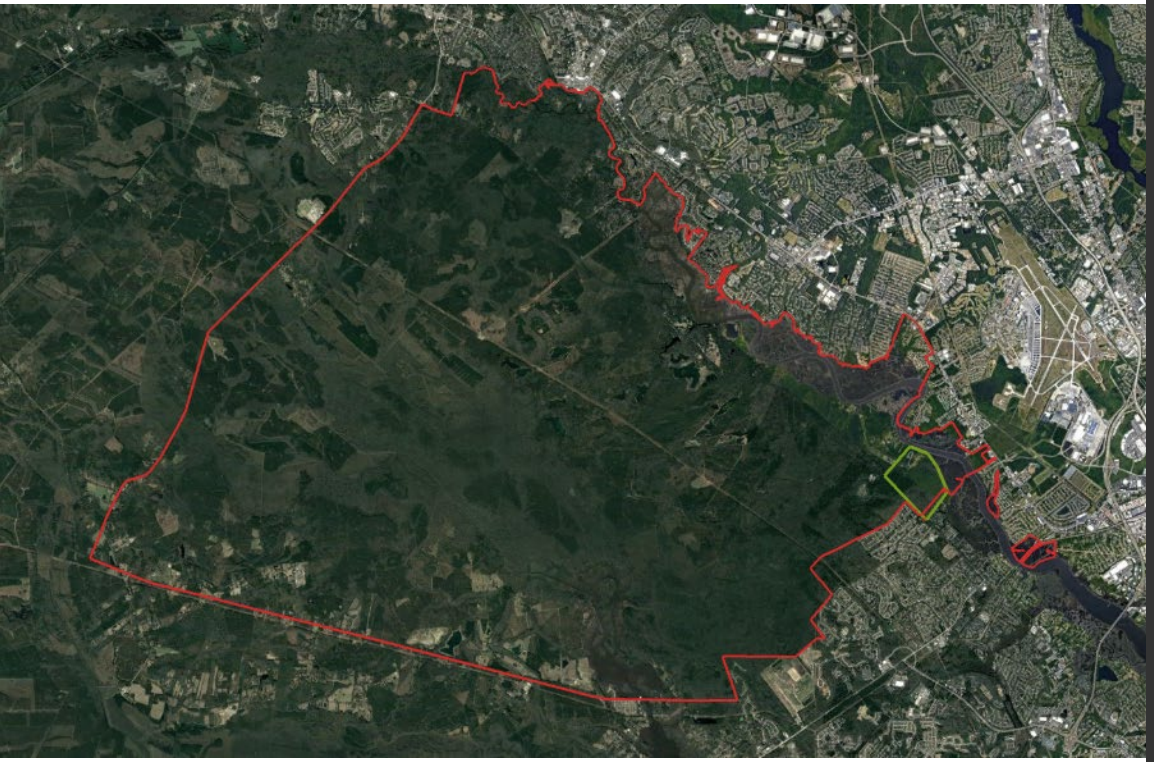

- Collaboration began Spring 2021
- Project expanded into two separate, yet overlapping study areas
- Drayton Hall – 665 acres
  - Highest level of detail possible with full range of geospatial products
- Ashley River Historic District – 72.8 mi^2 (46,599.3 acres)
  - High level of detail for project area of its size, but less than Drayton Hall project area

THE PROCESS TO UNCOVERING THE UNKNOWN

PEELING BACK THE LOWCOUNTRY OF SOUTH CAROLINA WITH LIDAR

THE PROCESS:

- Survey control
- Aerial acquisition
- Lidar calibration and classification
- Topographic mapping
- Aerial Triangulation
- Orthorectification of imagery

THE PROCESS TO UNCOVERING THE UNKNOWN

- Classified Lidar Point Cloud - Colorized
- Digital Elevation Models (DEMs) and Digital Surface Models (DSMs)– 1′ cell size raster files
    - Hydro-conditioned DEMs
- Engineering-grade full topographic mapping – GIS and CAD formats
    - Planimetric features
    - 1′ contours
    - DTM with breaklines and spot elevations
- 3Band Digital Orthophotography

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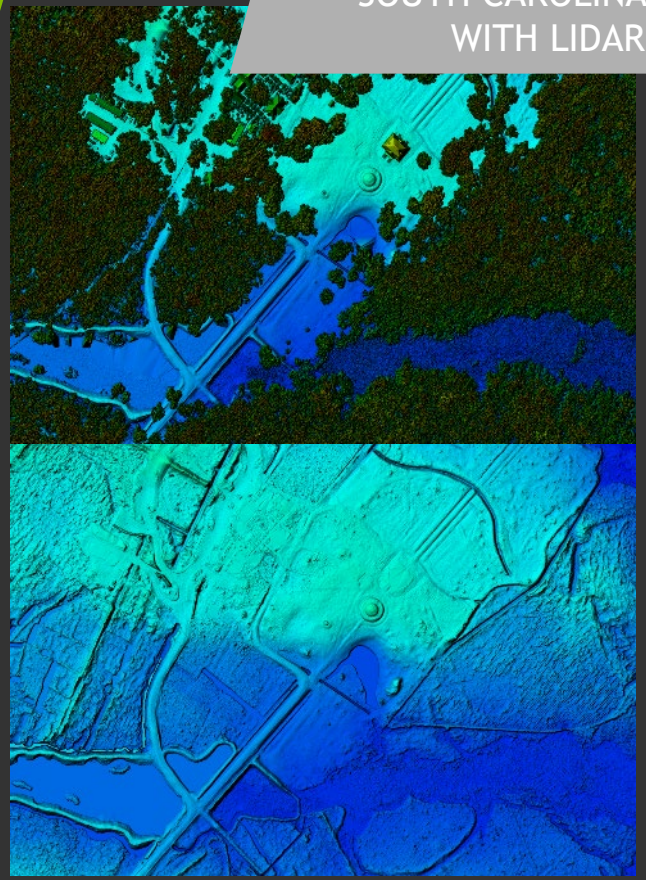

DATA COLLECTION

PEELING BACK THE LOWCOUNTRY OF SOUTH CAROLINA WITH LIDAR

DRAYTON HALL PROPERTY - AERIAL ACQUISITION	ASHLEY RIVER HISTORIC DISTRICT - AERIAL ACQUISITION
Fixed-wing manned aircraft, Riegl VQ-1560 II co-mounted with PhaseOne IXM 150 MP	Fixed-wing manned aircraft, Riegl VQ-1560 II co-mounted with PhaseOne IXM 150 MP
Flying height – 1,500’ above ground level (AGL)	Flying height – 3,500’ above ground level (AGL)
50% sidelap	50% sidelap
Lidar Point Density – 90 ppm^2 single pass (180 ppm^2 with overlap)	Lidar Point Density – 40 ppm^2 single pass (80 ppm^2 with overlap)
Imagery Collection – 1.5” Ground Sample Distance (GSD)	Imagery Collection – 3” Ground Sample Distance (GSD)
Flight Lines – 7	Flight Lines – 27

DATA COLLECTION

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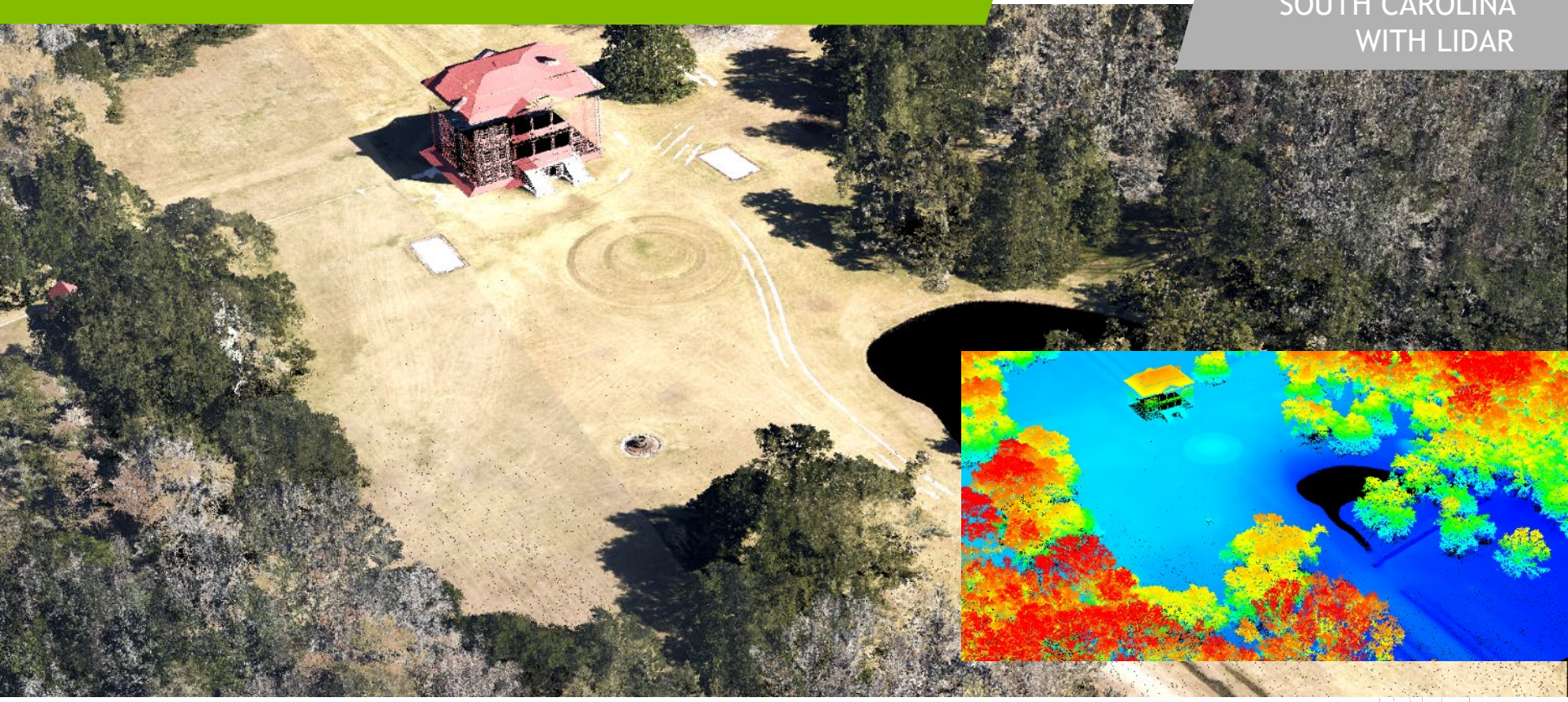
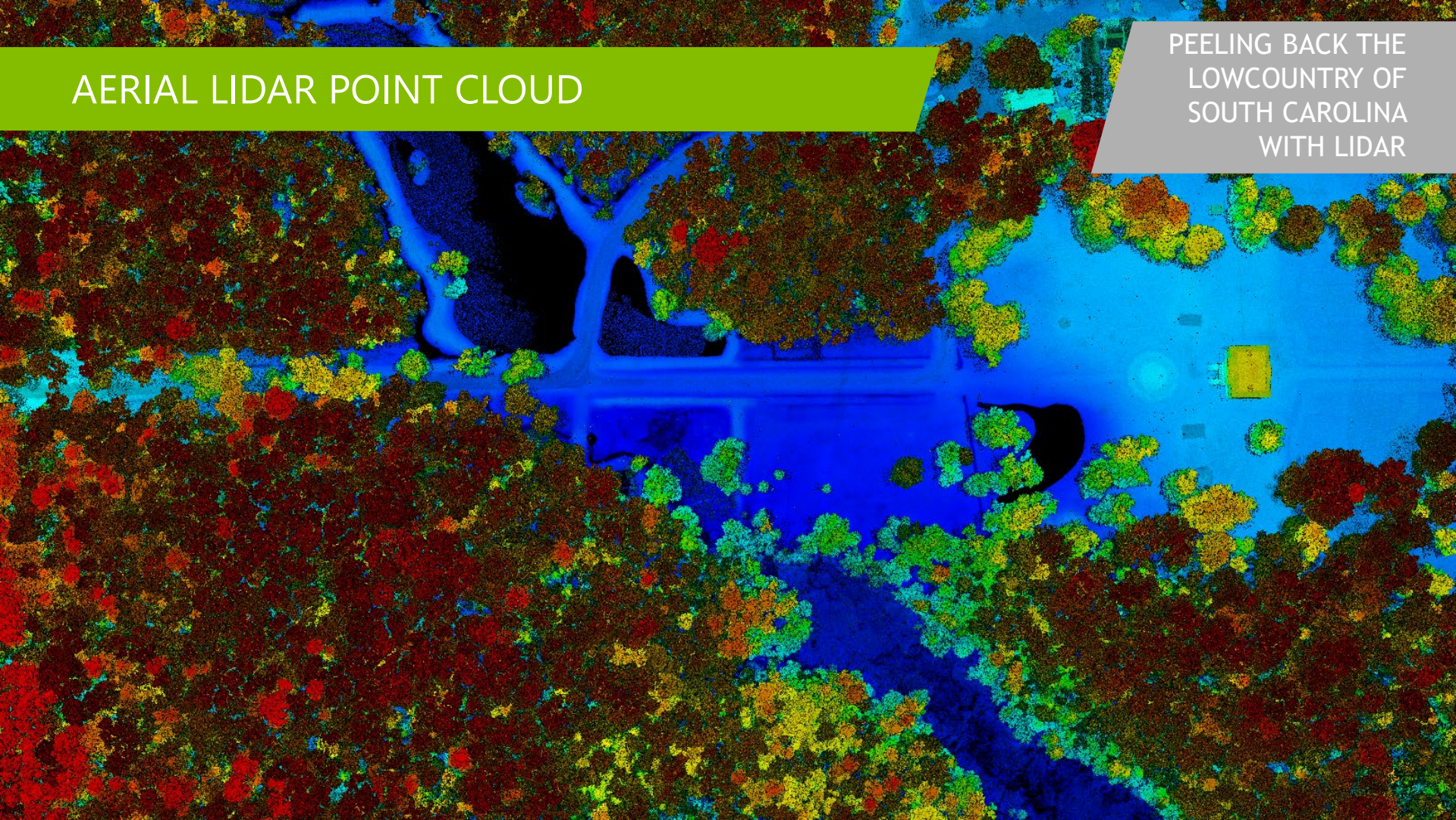


AERIAL LIDAR POINT CLOUD



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AERIAL LIDAR POINT CLOUD

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SURFACE MODELING: DSM & DEM

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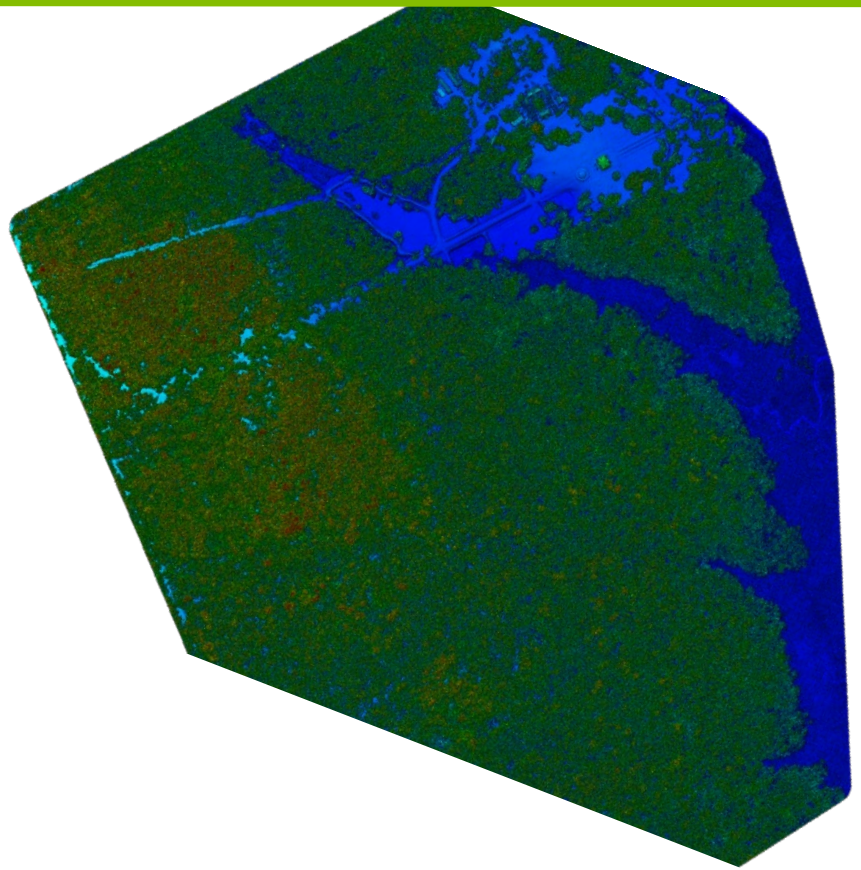

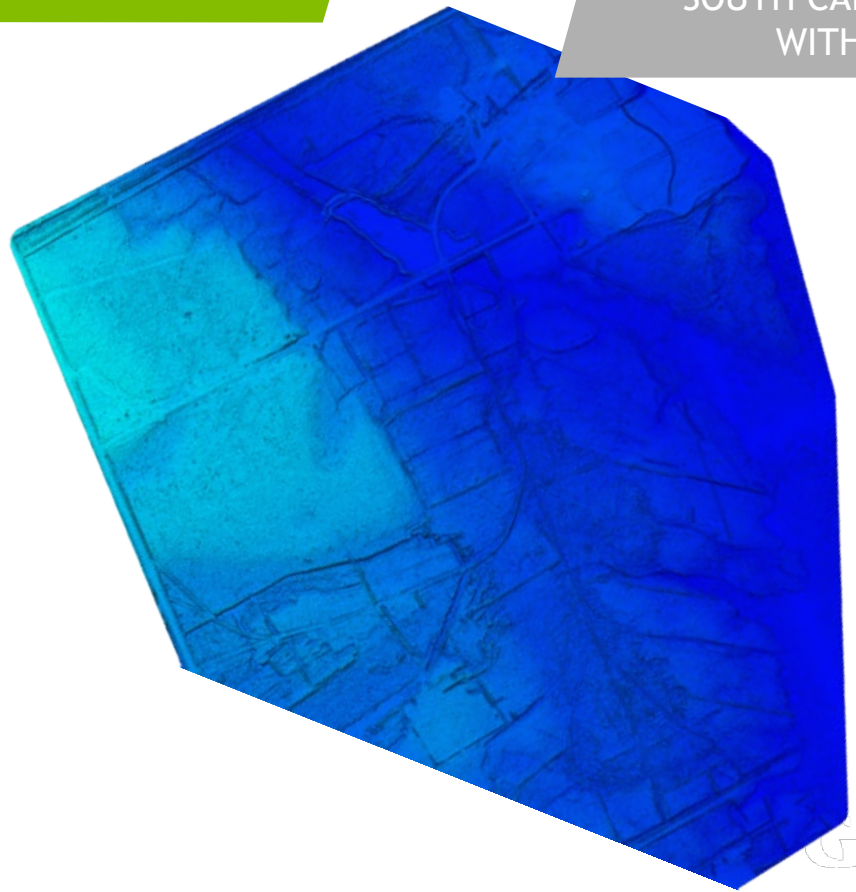

BARE EARTH LIDAR DEM

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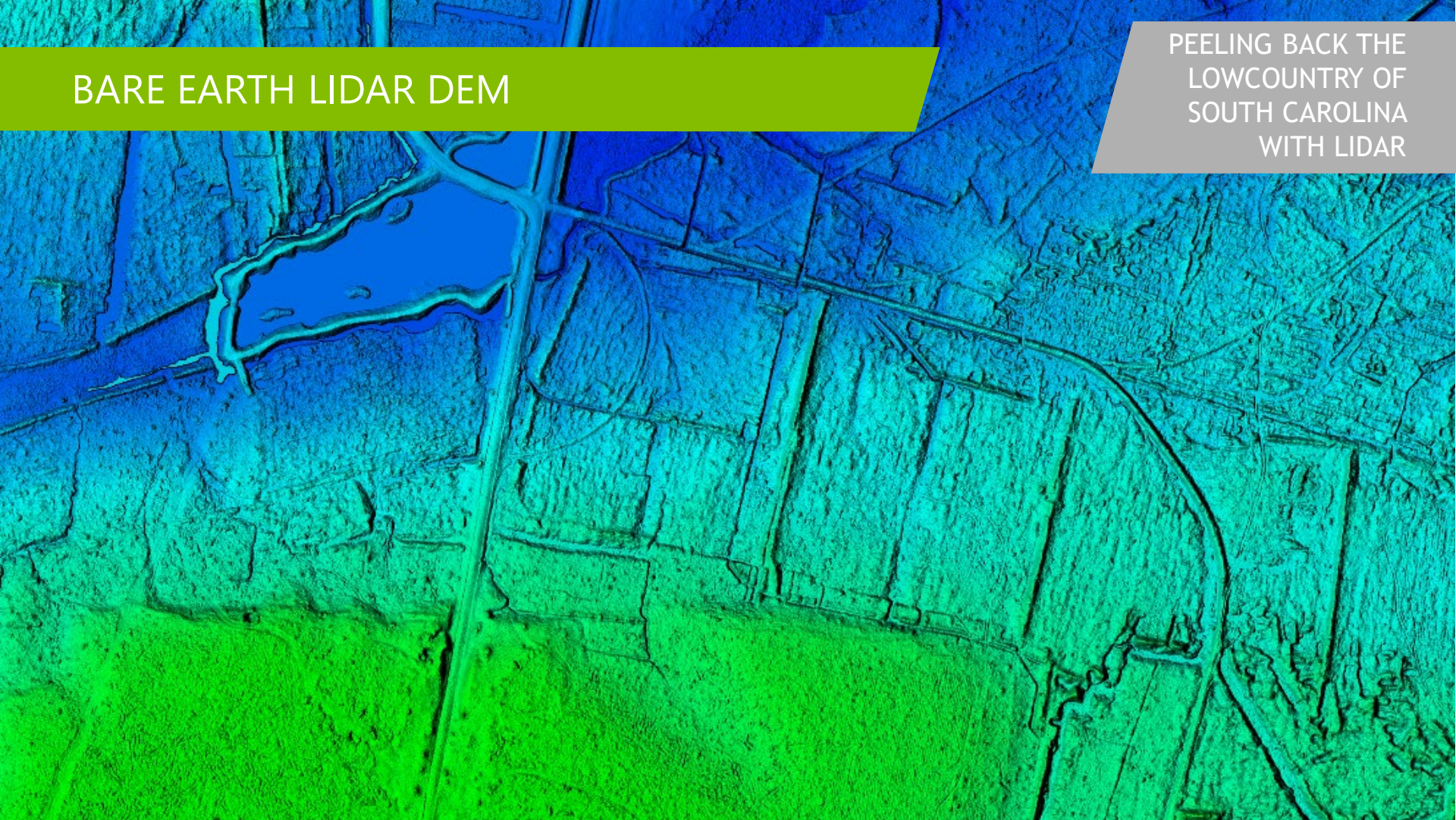

TOPOGRAPHIC MAPPING

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DRAYTON HALL – RESULTS OF THE RESEARCH

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AFRICAN AMERICAN CEMETERY

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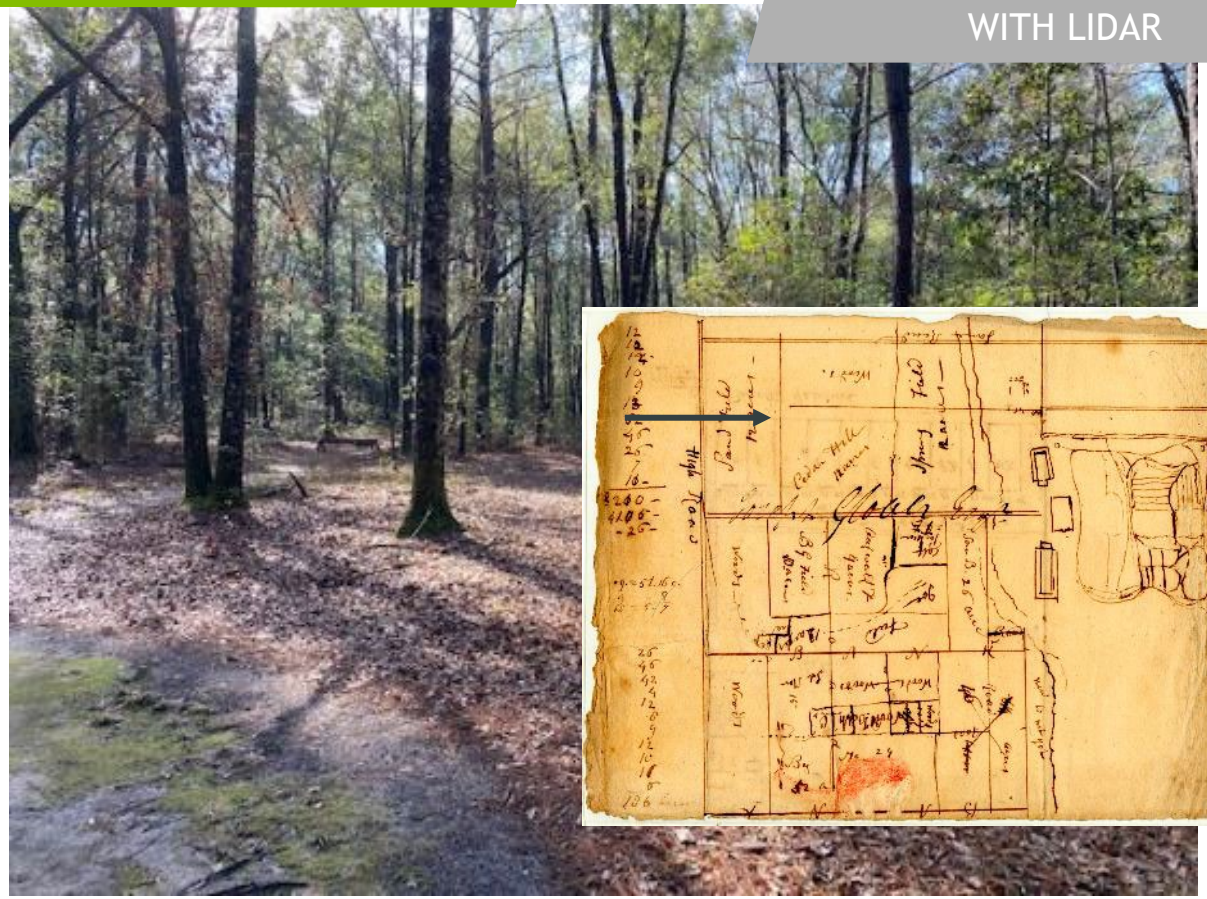

AFRICAN AMERICAN CEMETERY

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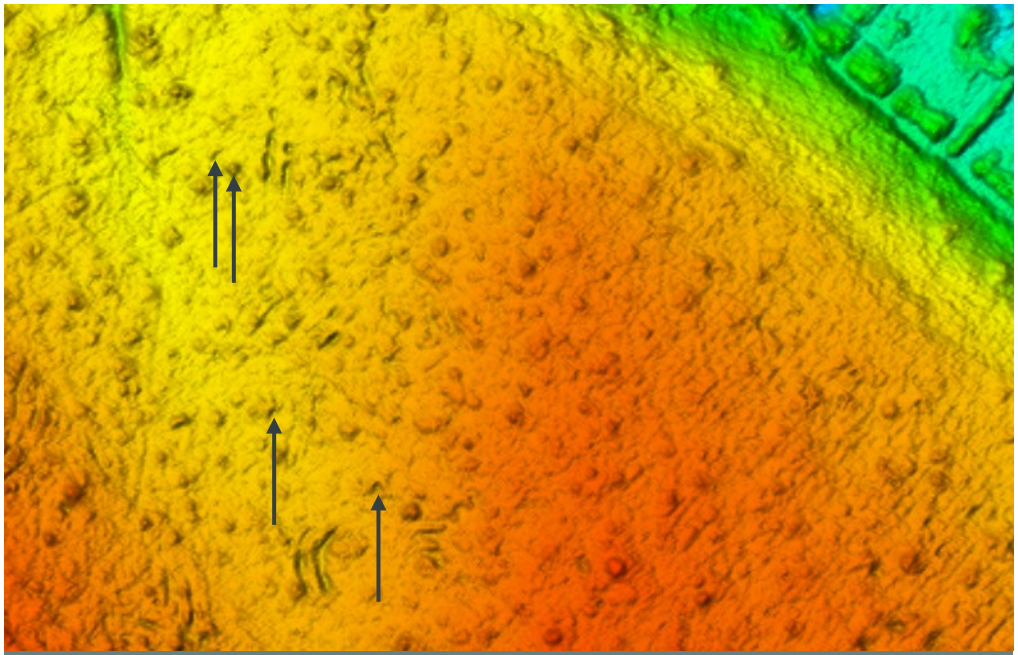
Grave Shaft Depressions



Previously unidentified grave shafts, ground-truthed through pedestrian survey and clearing

PHOSPHATE MINING

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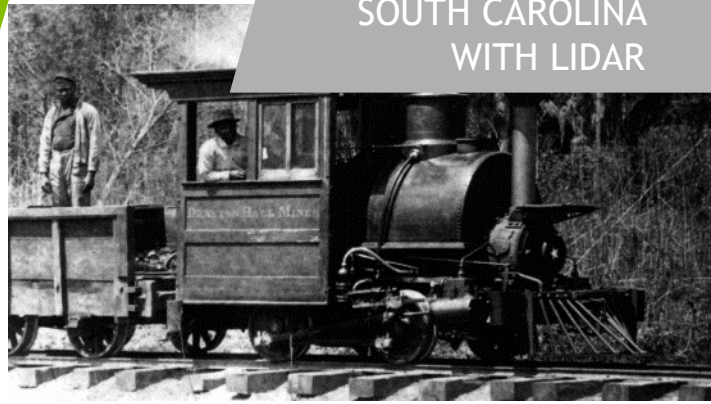

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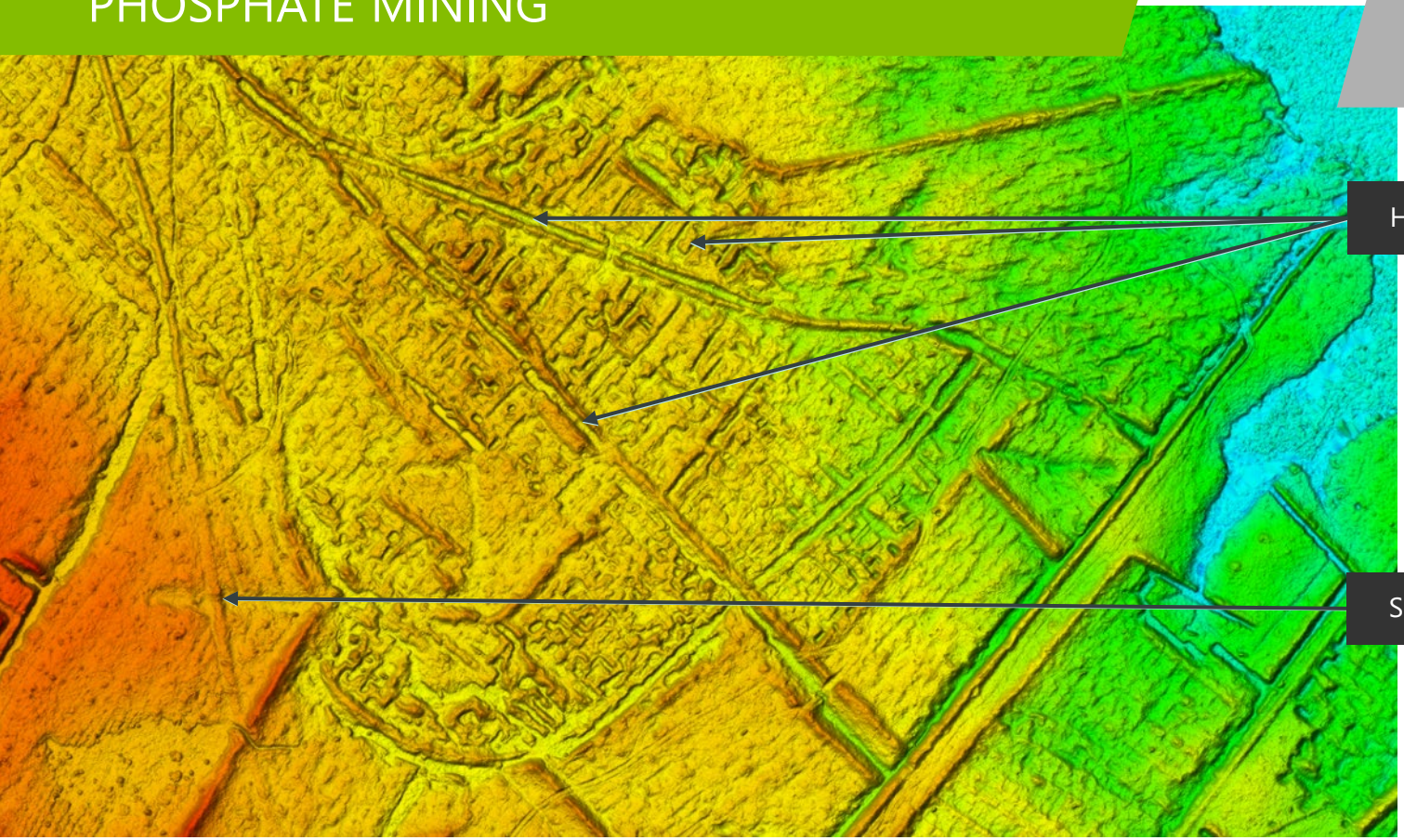
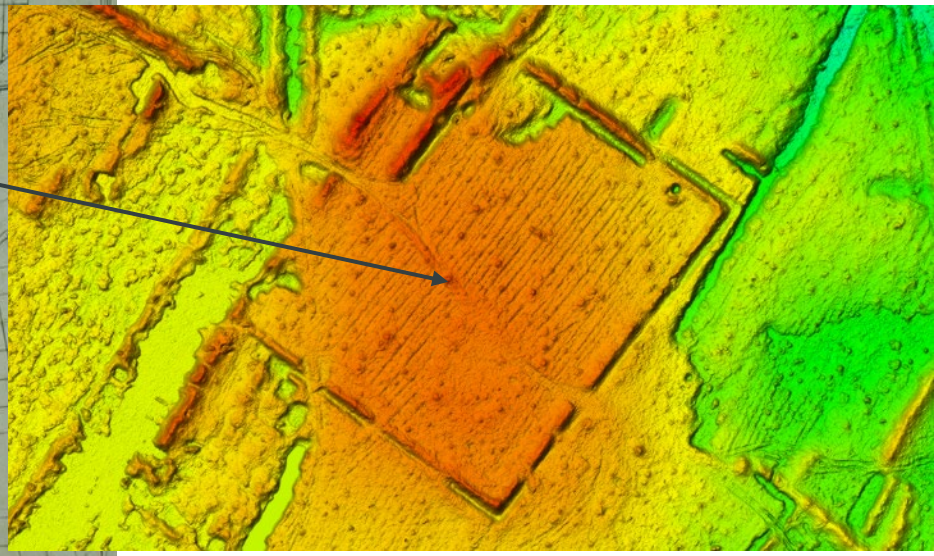


AGRICULTURAL EVIDENCE



Map of part of the Drayton Hall plantation, c. 1790
The grid system marks "tasks" or areas allocated for one slave to work on a given day

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ENSLAVED BARRACKS & STRUCTURES

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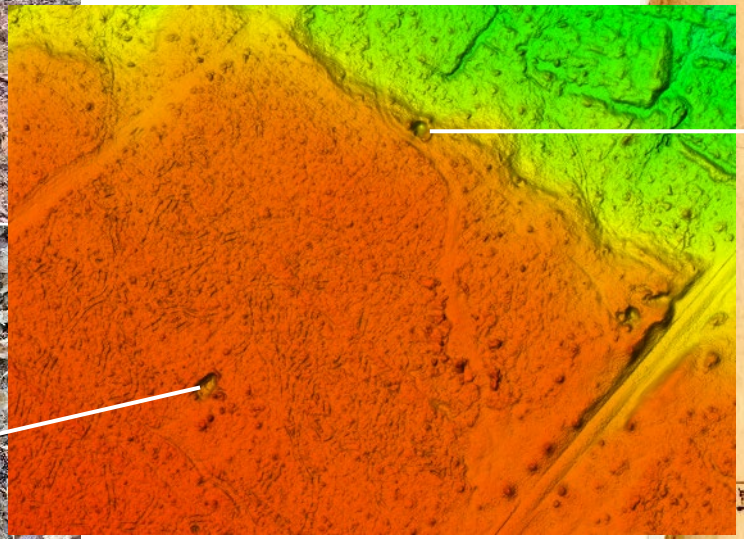
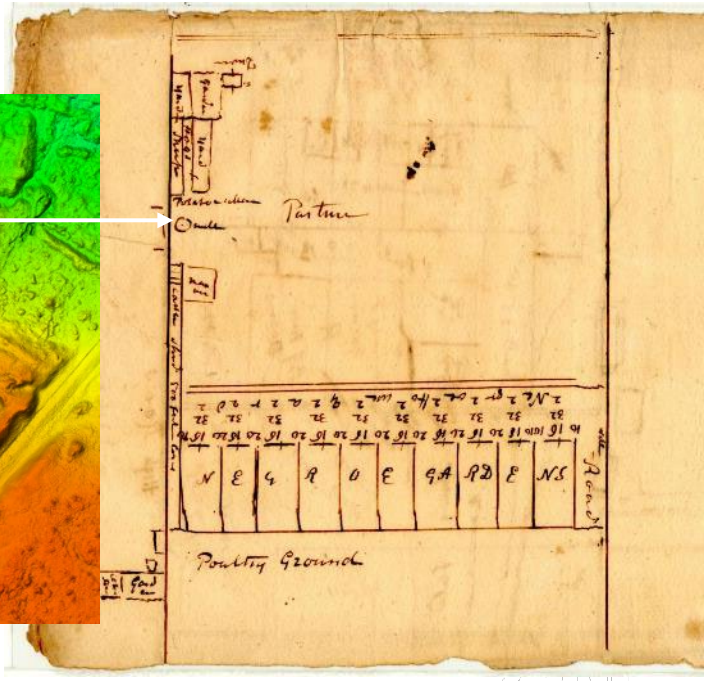
Bricks in course within depression





A well included on original design of slave barracks by John Drayton

CONCLUSION – LOOKING FORWARD

- High density aerial lidar data proved to be an efficient tool for this historical landscape preservation project
- Having accurate elevation models of this historical landscape has enabled researchers to pinpoint areas of interest for future
- Future remote sensing and surveying projects lie ahead

QUESTIONS?

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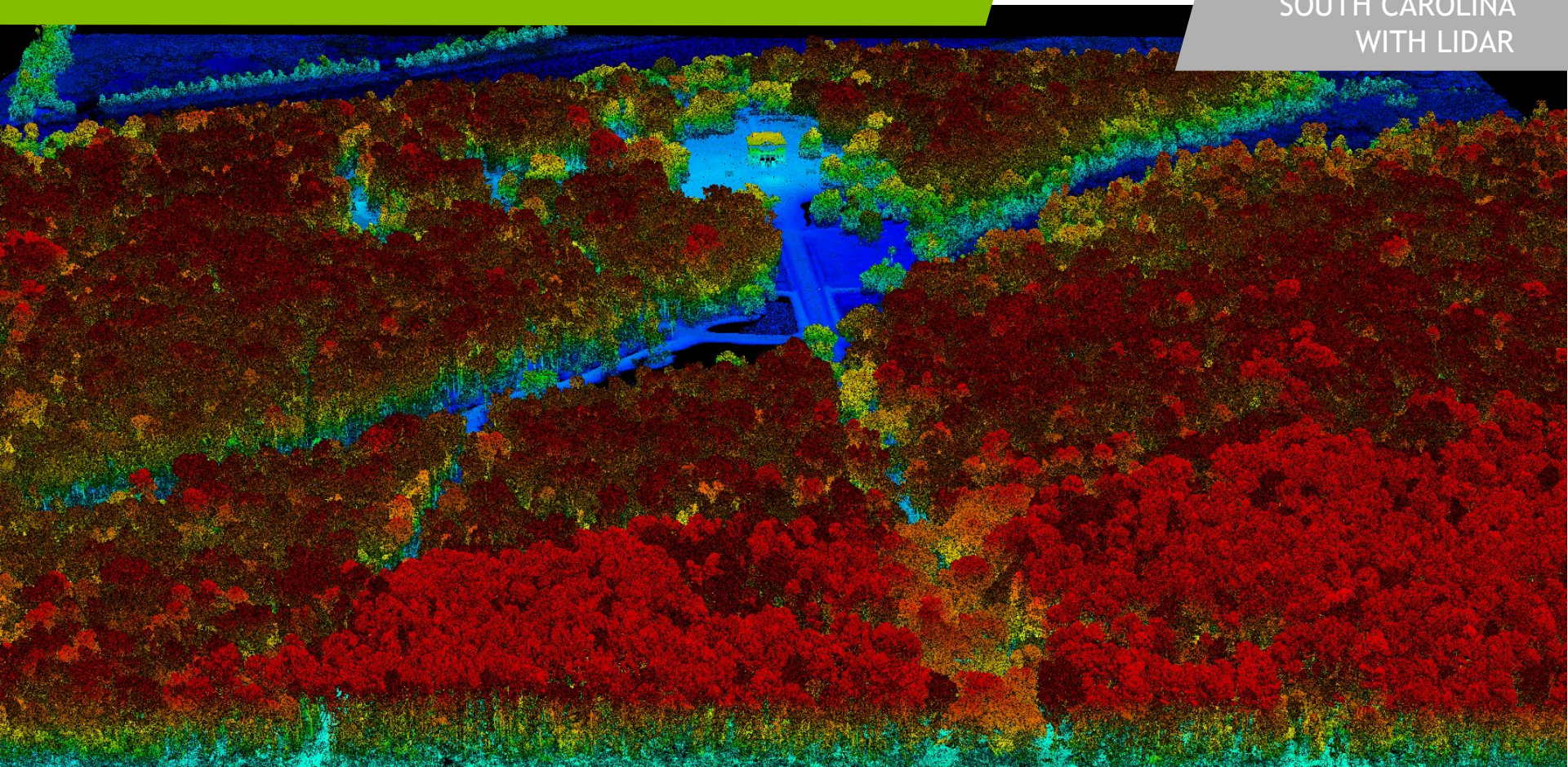

THANK YOU!

Thank you –
Drayton Hall Preservation Trust
Luke Pecoraro and Dr. Carter Hudgins
www.draytonhall.org

FOR MORE INFORMATION CONTACT:

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