Lidar Analysis to Evaluate Relationships Between Heir's Properties and Bio-Fuel Buildup

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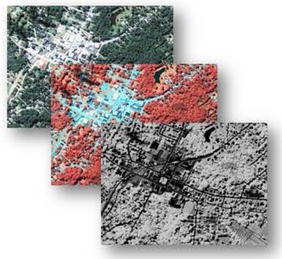
Abstract

This project analyzes the relationship between heir'a properties and fuel buildup in close proximity to national forests using both lidar and real estate assessment data. Because land titles associated with heir's properties are classified as unclear or ambiguous with respect to the entirety of property claimants, this land tenure form constrains landowner ability to use the property to leverage assets or to participate in land improvement programs offered by state or federal governments.

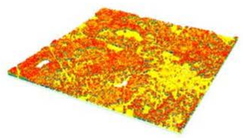
Federal land management agencies are keenly interested in estimations of the extent of heir's property because of links between this property ownership form and land loss, especially among southern, rural African Americans.



Also, from a land management perspective, private properties with unclear title often result in lack of supervison, in terms of attention to fuel buildup. An heir's properties raster layer was produced from tax assessment data and a fuel buildup raster layer was produced from a lidar dataset that identifies the location and density of vegetation existing within the vertical zone of one to six meters.

Background

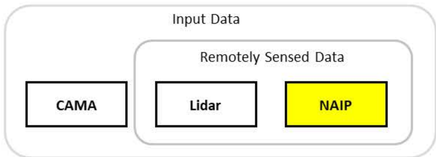
The purpose of this project is to identify and measure the density of vegetation near and around Heirs' Properties that are in close proximity to National Forest in Georgia.



A pixel-based regression analysis was performed on the two raster layers to determine the correlation, if any, between heir's properties and fuel buildup.

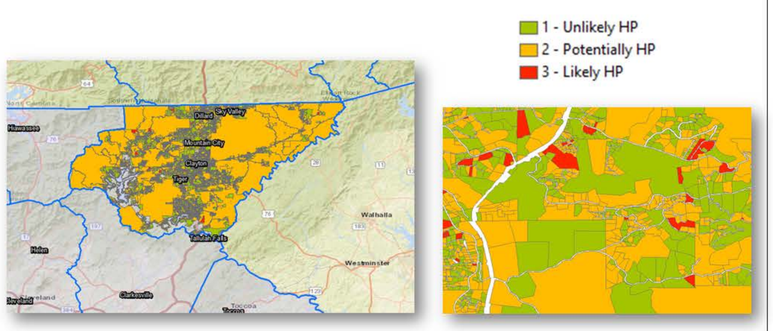
Data Preparation

Heirs Property Identification



Computer Assisted Mass Appraisal (CAMA) data contains information about tax parcels and their owners. CAMA data are maintained at the county level often by the tax assessor or appraiser. Some counties indicate which properties would be considered heirs while other do not. In those counties, CAMA data was analyzed and each property was assigned a score based on the specific characteristics about the property and the owner.

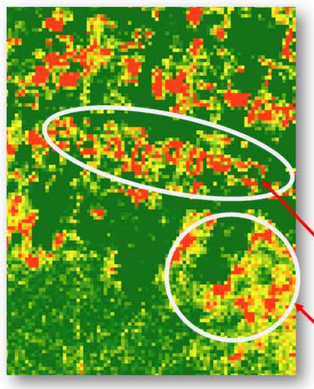
Properties with a score above a certain threshold were considered heirs. Those properties were matched to the parcels in the parcel GIS layer and finalized as a HP polygon layer.



Data Preparation

LiDAR and Imagery Processing

Lidar was used to determine the location of fuel build-up in the vertical zone between one and six meters. A customized toolset was developed that calculated the number of lidar returns in this zone as a percentage of the total number of returns were collected and rasterized the results.



Process 1

Custom Toolset Limitation

- Measures all height of return for points that are within 1-6 meters
- Does not distinguish between vegetation and structures

Red = Higher point density

Housing Subdivision

Dense Vegetation

Medium Vegetation 1 – 6 Meters above the ground

Process 2: LiDAR Housing Footprints (bone map)

- 3D Mapping Hands with Lidar Point Cloud creates housing footprints from LiDAR
- Use building Footprints to "mask" out structures

LiDAR Limitations:

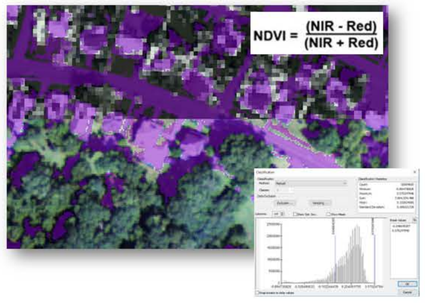
Misclassification of tall dense tress as buildings

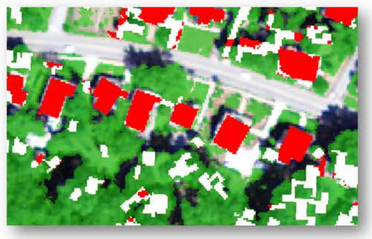
Process 3

NAIP 4-Band Arial Imagery

RGB & IR

- **Create NDVI**
- **Manually Identify NDVI threshold**
  - **Determine value to build a non-veg mask** (shown in purple) **to identify areas to remove that are not vegetation**





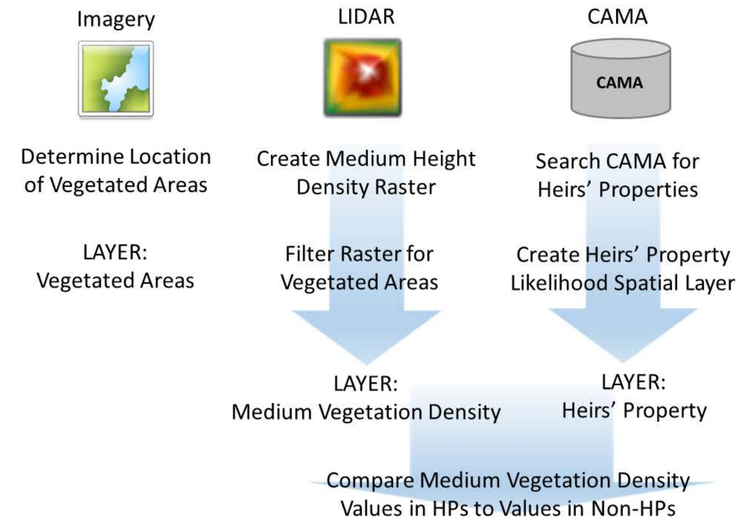
Buildings were filtered from the raster by generating building footprints from the lidar. In order to reduce the amount of data that were misclassified as buildings, an NDVI layer was used to separate buildings from vegetation.

LiDAR/NDVI Hybrid

By combining both the LiDAR building footprints and veg/non-veg NDVI map, The resulting product is a more accurate representation of actual structures:

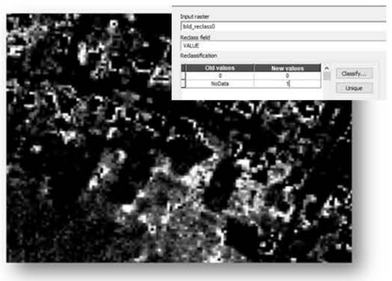
CGR
Center for Geospatial Research
The University of Georgia

Methods



Final Biomass Pixel Values

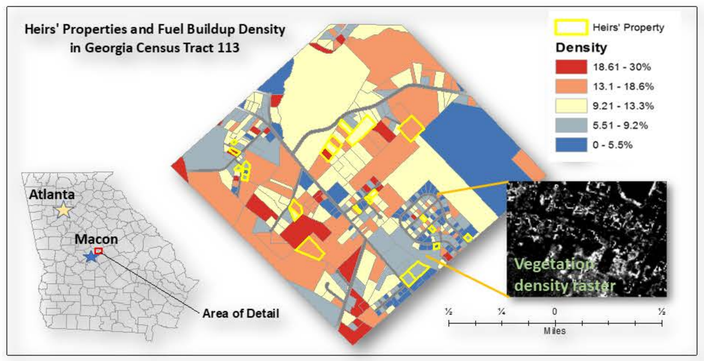
- Re-class the buildings layer to = 0 & no data = 1
- Multiply the new 0 and 1 layer with the point density output layer (from process 1) using raster calculator



Discussion

Identify properties that are most likely heirs based on population and property ownership data.

- Heirs Properties (HPs) are parcels of land with unclear ownership. Often passed down from generation to generation and are often unclear and difficult to define
- Mismanagement or lack of oversight to the property could result in heavy fuel build up and hazardous conditions



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