Using LIDAR for Greater Rio Grande Watershed Alliance Pre-Treatment Vegetation Monitoring

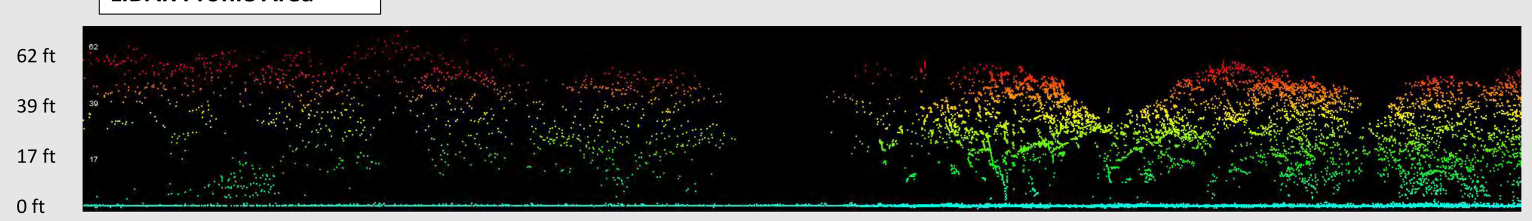
Introduction:

LIDAR, light detecting and ranging, elevation data were used to estimate vegetation height and canopy characteristics for two GRGWA pre-treatment project sites. 2012 LIDAR was provided by Bureau of Reclamation, flown in February. 2011 Digital Globe imagery was collected at the end of March. LIDAR provides a detailed analysis of vegetation and canopy structure to supplement field monitoring data. These two sample areas provide a contrast in Hink and Ohmart classification types. Los Lunas Bridge has very little understory vegetation while Belen 2 has significant understory vegetation.

Valencia SWCD /Los Lunas Bridge

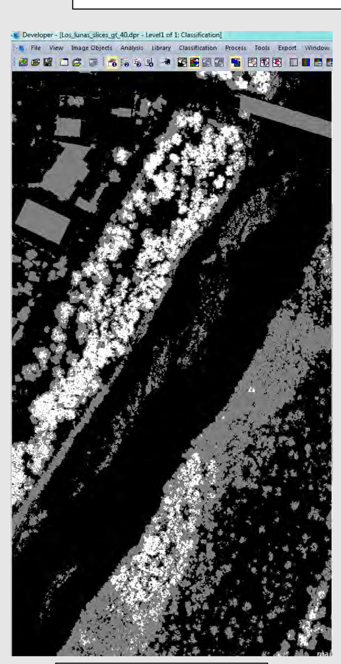
LIDAR Profile Area

Los Lunas photo point at beginning of 3-D profile, looking South, taken 1-30-12.



3-D canopy representation can be used to identify presence or absence of understory vegetation. In Los Lunas Bridge area there is little understory vegetation as indicated in this profile

eCognition Classification using Digital Surface Models and 2012 imagery

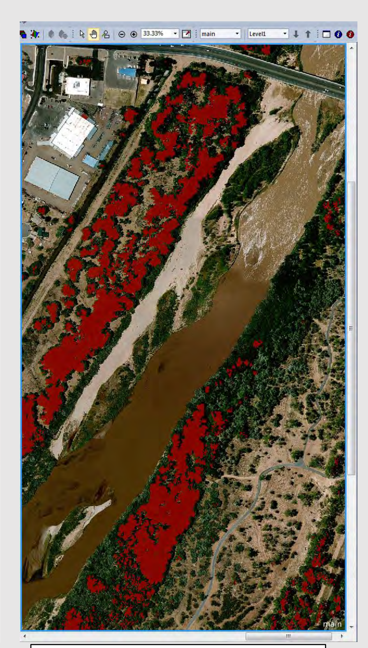


Digital Surface Model

Vegetation 0.5-5 feet

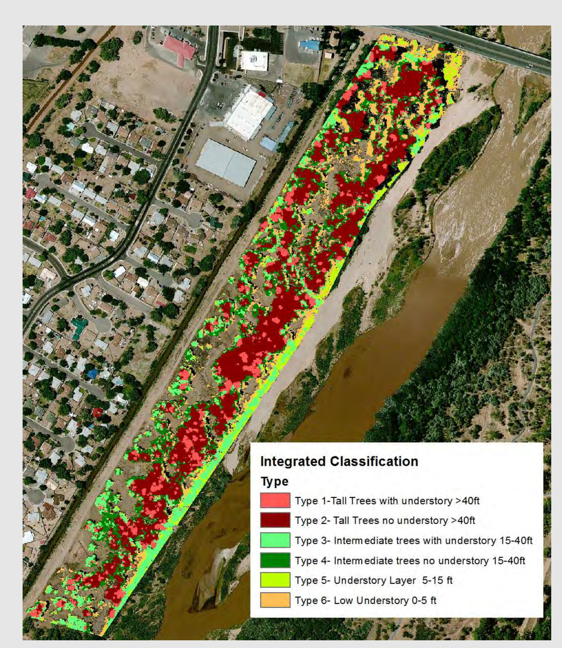
Vegetation 5-15 feet

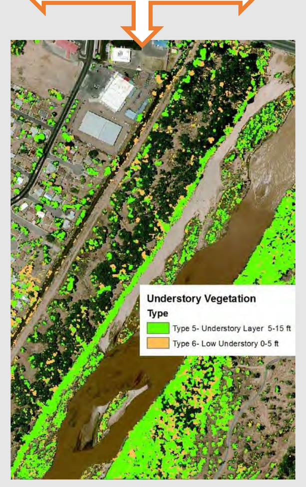
Vegetation 15-40 feet



Vegetation greater than 40 feet

Integrated Classification With Understory Vegetation Layer





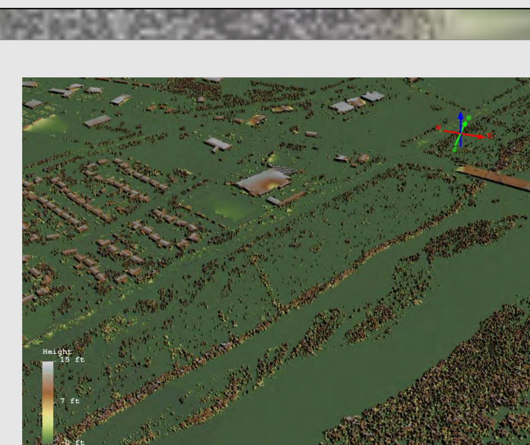
Understory Vegetation Layer
Created by Combining
0-5ft and 5-15ft Vegetation Classifications

Understory Layer		
Height	Acreage	Percent of Study Area
5-15 feet	4.50	12.91%
.5-5 feet	2.85	8.16%

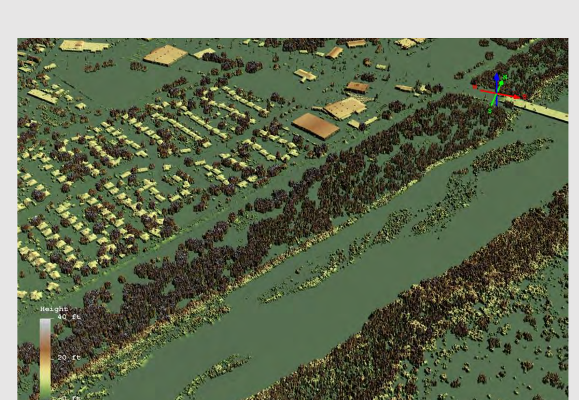
Results: Integrated Classification by Height Class – Modified Hink and Ohmart Definitions

Height Class	Height	Acreage	Percent of Study Area
Multiple Story Communities			
Type 1 Tall Trees with well developed understory	Greater than 40ft	2.78	7.96%
Type 2 Tall Trees with little or no understory	Greater than 40ft	9.23	26.44%
Type 3 Intermediate-sized trees with dense understory	15-40 feet	3.52	10.08%
Type 4 Intermediate-sized trees with little or no understory	15-40 feet	4.10	11.74%
Single Story Communities			
Type 5 - Stands with dense shrubby growth	5-15 feet	1.31	3.85%
Type 6 - Very young and low growth	.5-5 feet	3.70	10.90%
			Percent of Study Area
Vegetaive Areas		24.66	70.65%
Bare ground or herbacious vegetation		10.25	29.36%

Examples of digital surface models by height thresholds
(Los Lunas Bridge)



Digital Surface Model 5-15 feet

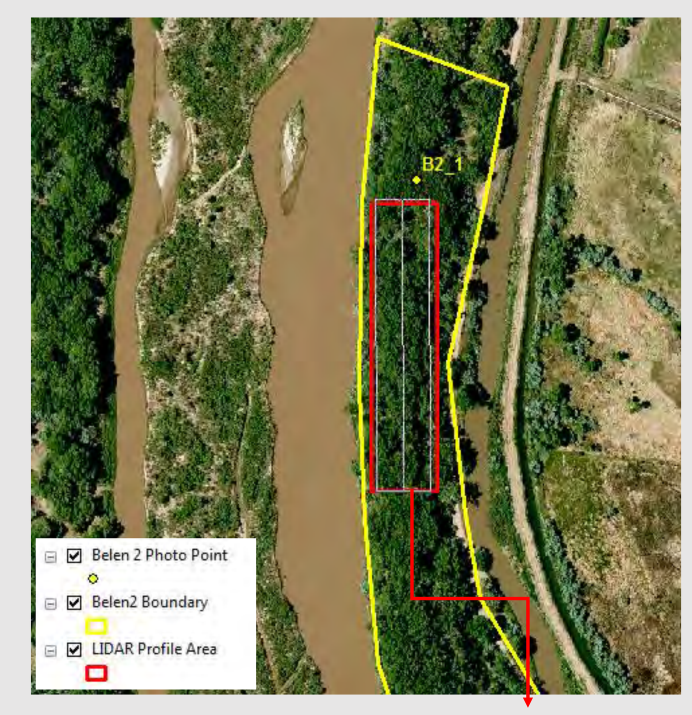


Digital Surface Model 0-40 feet

Classification by Height Class -Procedures

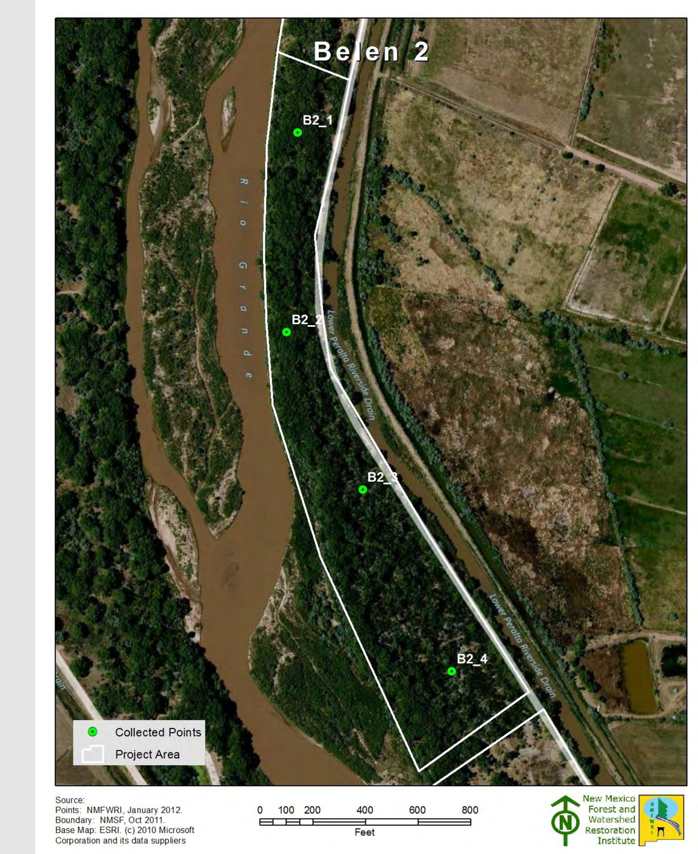
1. The LIDAR point cloud was filtered to isolate first returns and then LIDAR elevations were calculated to represent height above ground level (AGL).
2. The AGL point cloud was exported by height categories that correlate with Hink and Ohmart height classes. These separate point clouds were then converted into separate digital surface models and exported as GeoTiffs.
3. Understory vegetation was classified first. Understory vegetation were classified using 0.5-5ft and 5-15ft digital surface models and 1 foot 2012 4-band ortho-imagery within eCognition. Image segmentation within eCogntion were based on surface models. NDVI (Normalized Difference Vegetation Index) from the ortho-imagery was calculated and incorporated as a threshold to determine vegetation from dead or non-vegetative areas. The two resulting classifications were combined into one image representing total understory vegetation.
4. The understory vegetation layer was used as an input in the multiple story community classifications (Types 1-4). A digital surface model for all heights was used to classify intermediate and tall trees. This classification incorporated the two height classes 15-40ft and greater than 40ft as well as NDVI to identify active vegetation. Once the two height classes were classified, the understory vegetation layer was used to identify whether each class has understory vegetation or not and was and was then classified accordingly (see integrated classification maps and result tables).

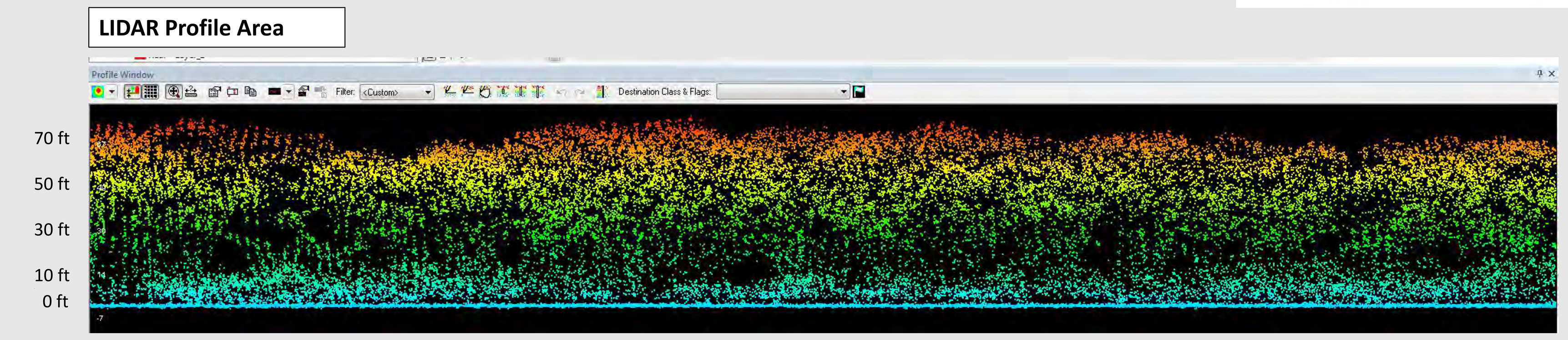
Valencia SWCD / Belen 2



LIDAR Profile Area

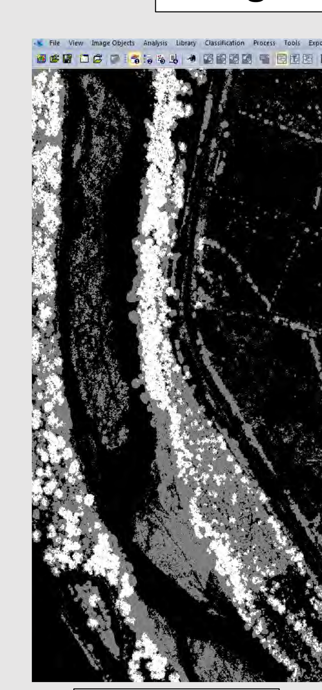
Belen 2_1 photo point at beginning of 3-D profile, looking South, taken 1-12-12.



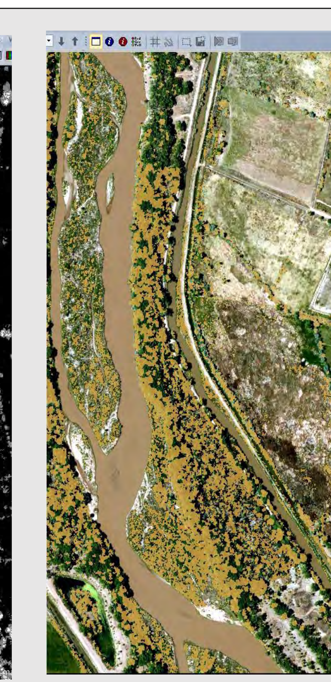


3-D canopy representation can be used to identify presence or absence of understory vegetation. In the Belen 2 area there is significant understory vegetation as indicated in this profile

eCognition Classification using Digital Surface Models and 2012 imagery

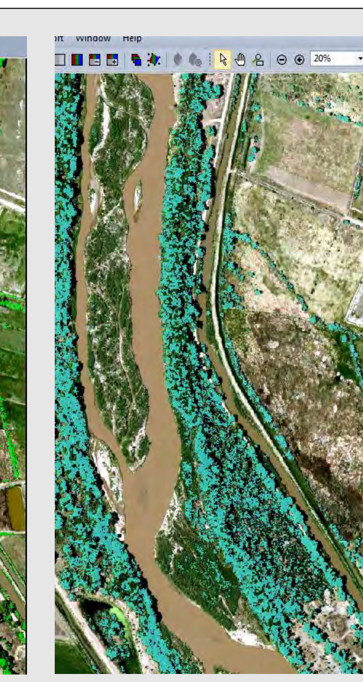


Digital Surface Model



Vegetation 0.5-5 feet

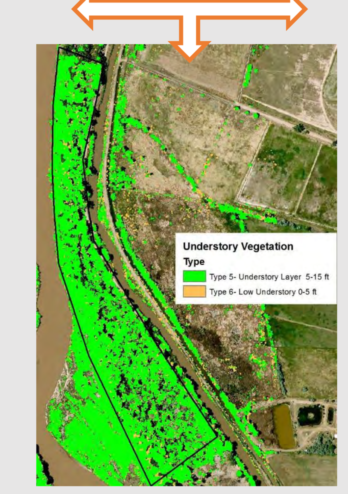
Vegetation 5-15 feet



Vegetation 15-40 feet

Vegetation greater than 40 feet

Integrated Classification With Understory Vegetation Layer



Understory Vegetation Layer
Created by Combining
0-5ft and 5-15ft Vegetation Classifications

Understory Layer		
Height	Acreage	Percent of Study Area
5-15 feet	14.46	72.01%
.5-5 feet	1.31	6.52%

Results: Integrated Classification by Height Class – Modified Hink and Ohmart Definitions

Height Class	Height	Acreage	Percent of Study Area
Multiple Story Communities			
Type 1 Tall Trees with well developed understory	Greater than 40ft	8.32	41.43%
Type 2 Tall Trees with little or no understory	Greater than 40ft	0.50	2.49%
Type 3 Intermediate-sized trees with dense understory	15-40 feet	7.21	35.91%
Type 4 Intermediate-sized trees with little or no understory	15-40 feet	0.16	0.78%
Single Story Communities			
Type 5 - Stands with dense shrubby growth	5-15 feet	1.43	7.12%
Type 6 - Very young and low growth	.5-5 feet	0.56	2.79%
			Percent of Study Area
Vegetaive Areas		18.20	90.64%
Bare ground or herbacious vegetation		1.88	9.36%

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