

Mapping Invasive Weeds Using UAVs, Remote Sensing, and GIS Analysis

Sundaran Gillespie, GISP; FAA Certified Remote Pilot



Mapping Invasive Weeds Using UAVs, Remote Sensing, and GIS Analysis

- Traditional Mapping Efforts
- UAV Overview and Advantages
- UAV Data Products
- Aerial Mapping Process
- Sample Projects
- Results
- Next Steps

Traditional Mapping Efforts

- Mapping done by foot
- Field constraints: heat, steep topography, access
- Mapping is hand-drawn (low accuracy)
- Field maps use free imagery (low res)
- Traditional manned aircraft imagery is very expensive

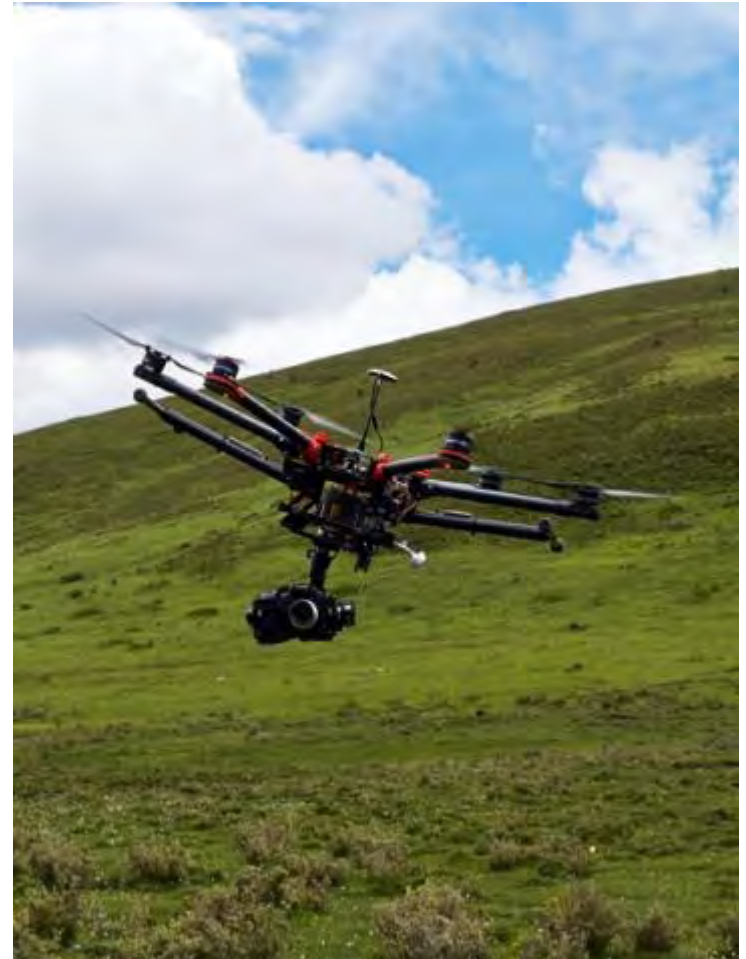


New Solution Needed...



Benefits of a UAV Platform

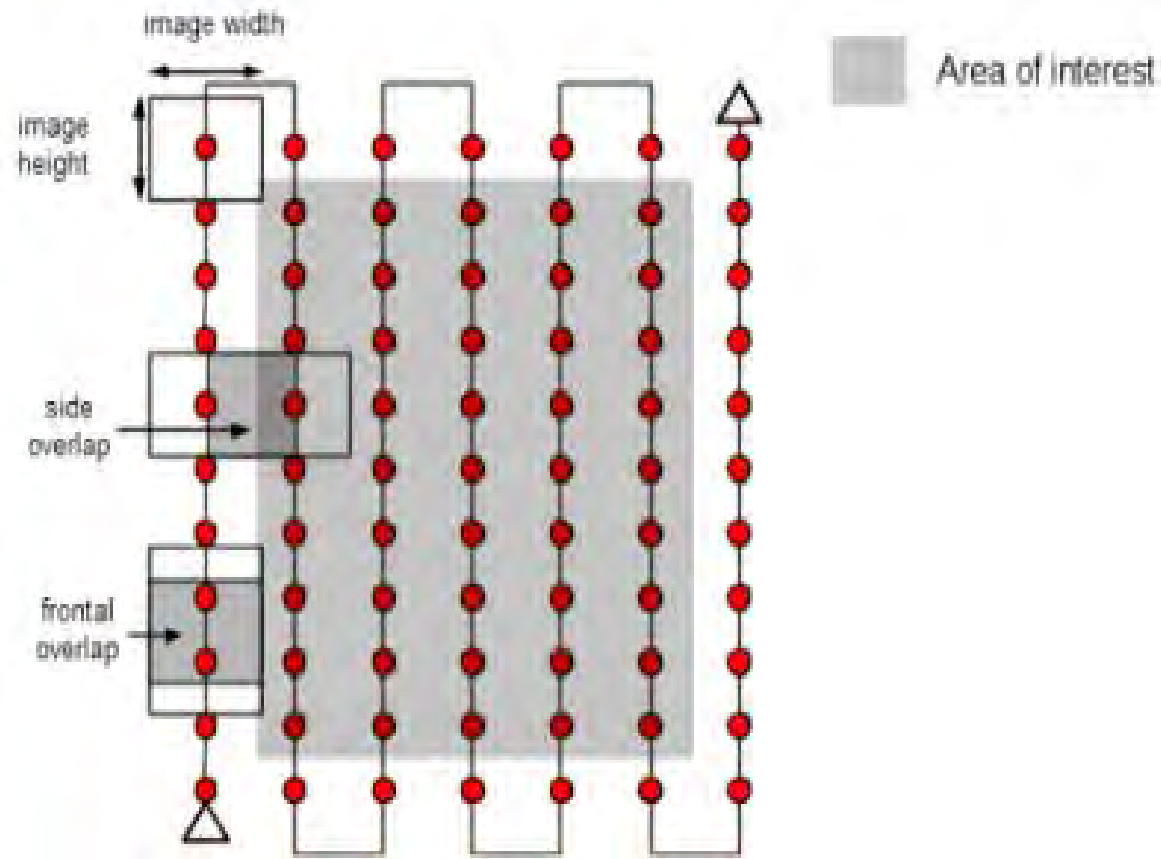
- **Cost Savings**
 - Cheap to fly
 - Less time in the field
 - Reduced cost = more flights
- **High Resolution/Accuracy**
 - 2cm or better
 - Programmed flights
 - Creates consistent data
 - Good remote sensing data



Sample Flight Path - Ridge Top Ranch

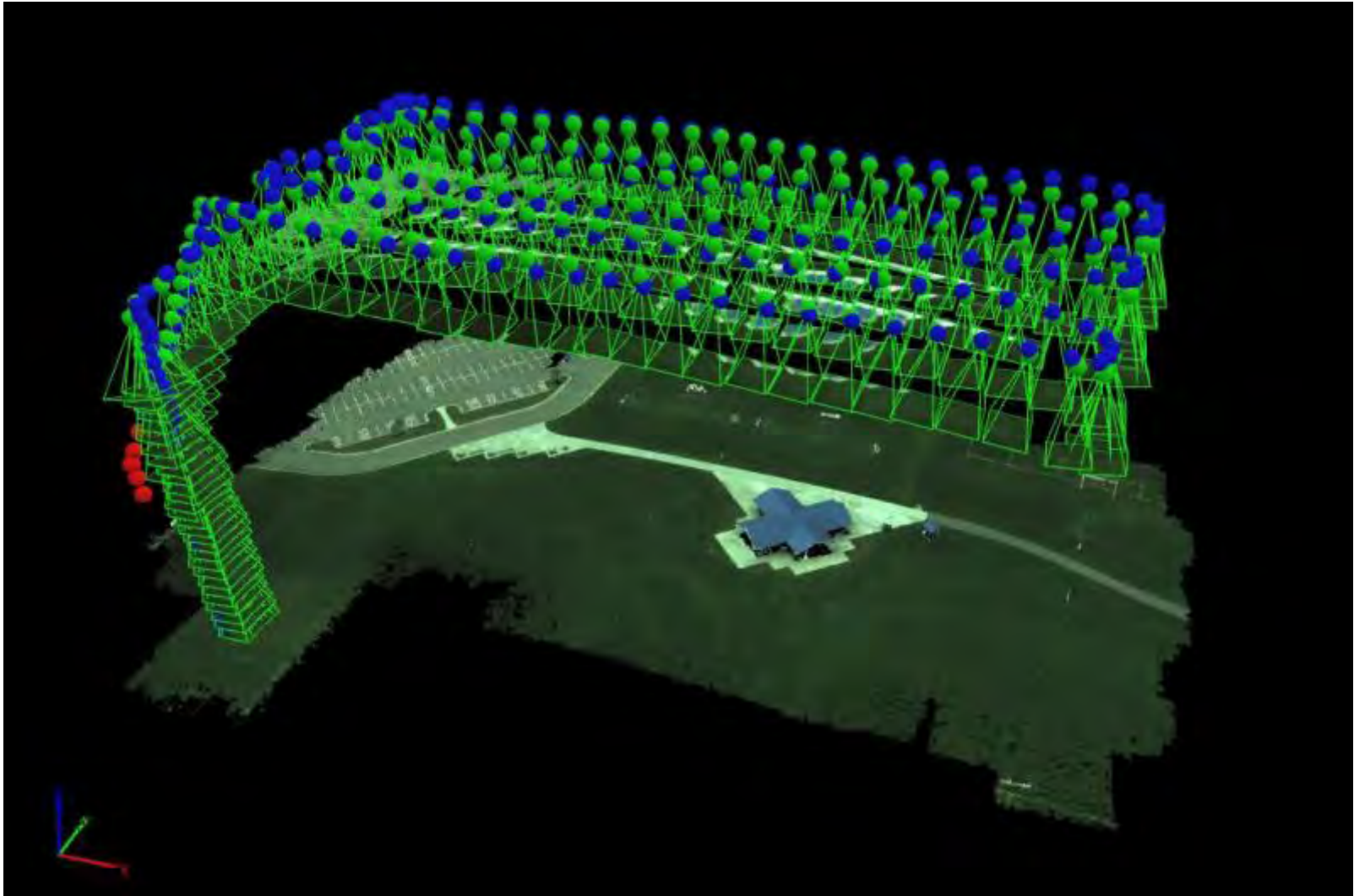


UAV Aerial Acquisition and Mosaicing

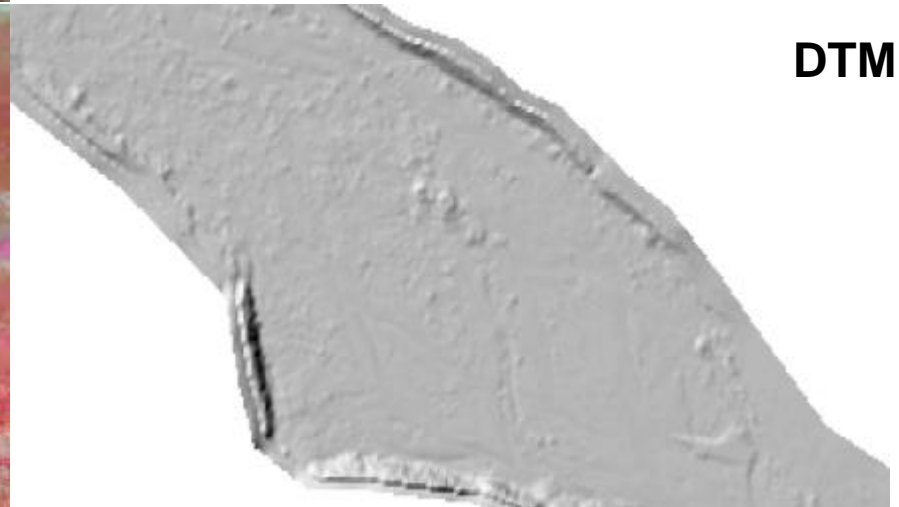
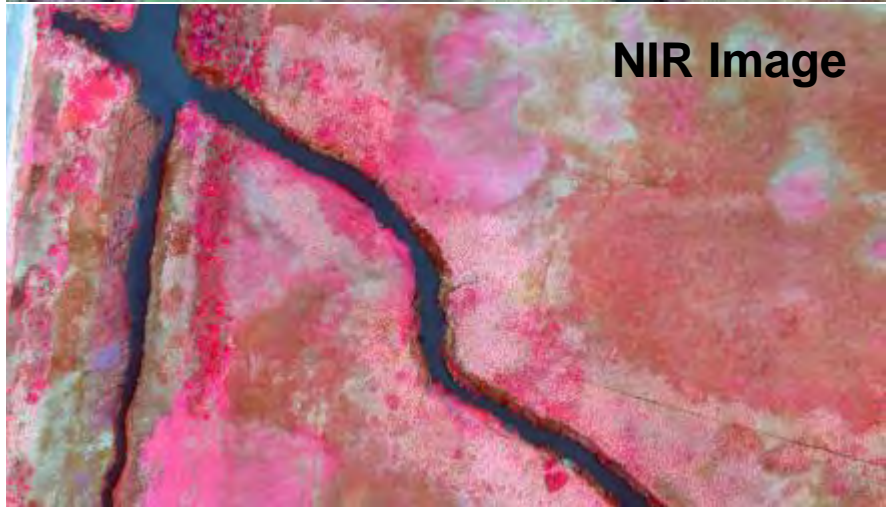
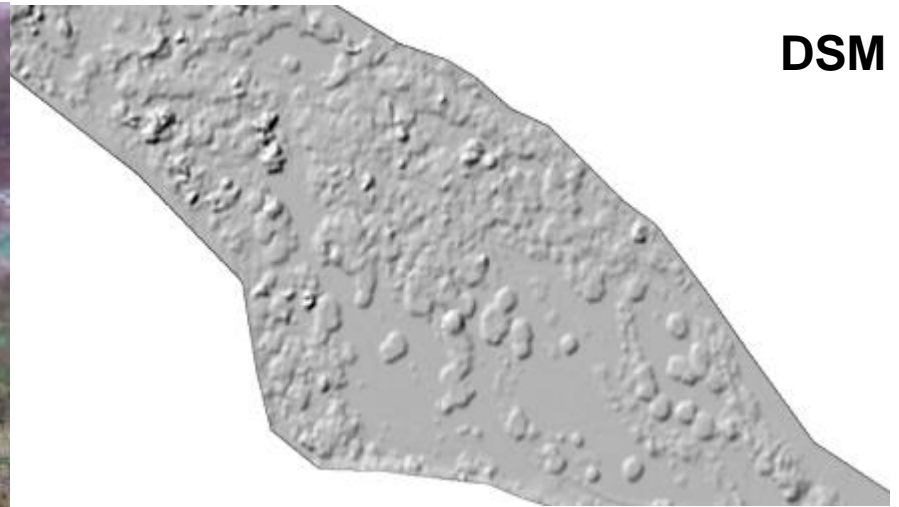


- Mosaic Software – Pix4D, Agisoft or similar

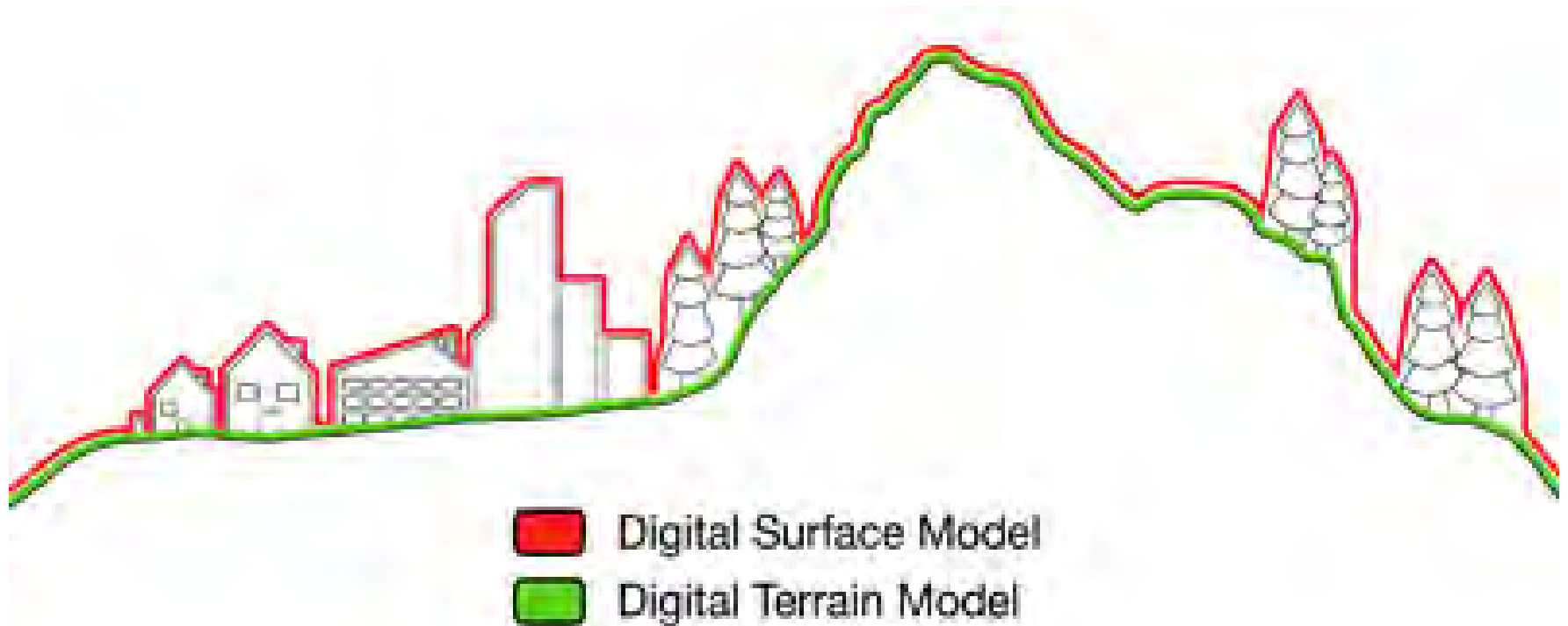
UAV Image Overlap in Pix4D



Sample UAV Datasets



DSM/DTM Explanation



Revised Weed Mapping Methodology

- Collect UAV Data
- Process Imagery and DSM (Pix4D)
- Image segmentation (eCognition)
- GIS data revisions
- Field spot check
- Revise final mapping



Sample Projects: Ridge Top Ranch Artichoke Thistle Treatment Mapping



Sample Area Low Resolution Aerial



Pre-treatment Artichoke Thistle



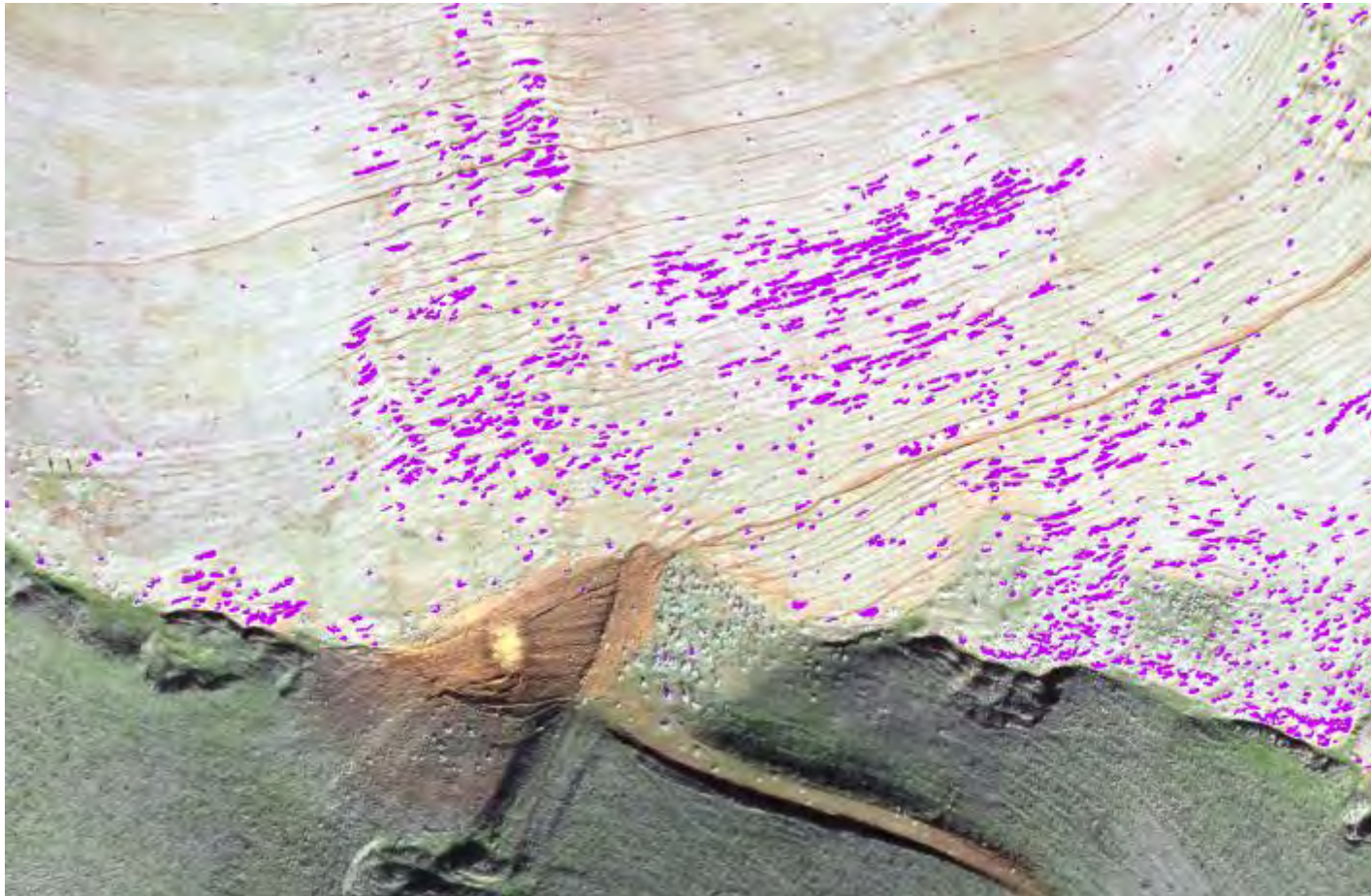
UAV Aerial Mosaic (2cm Resolution)



Pre-treatment Artichoke Thistle



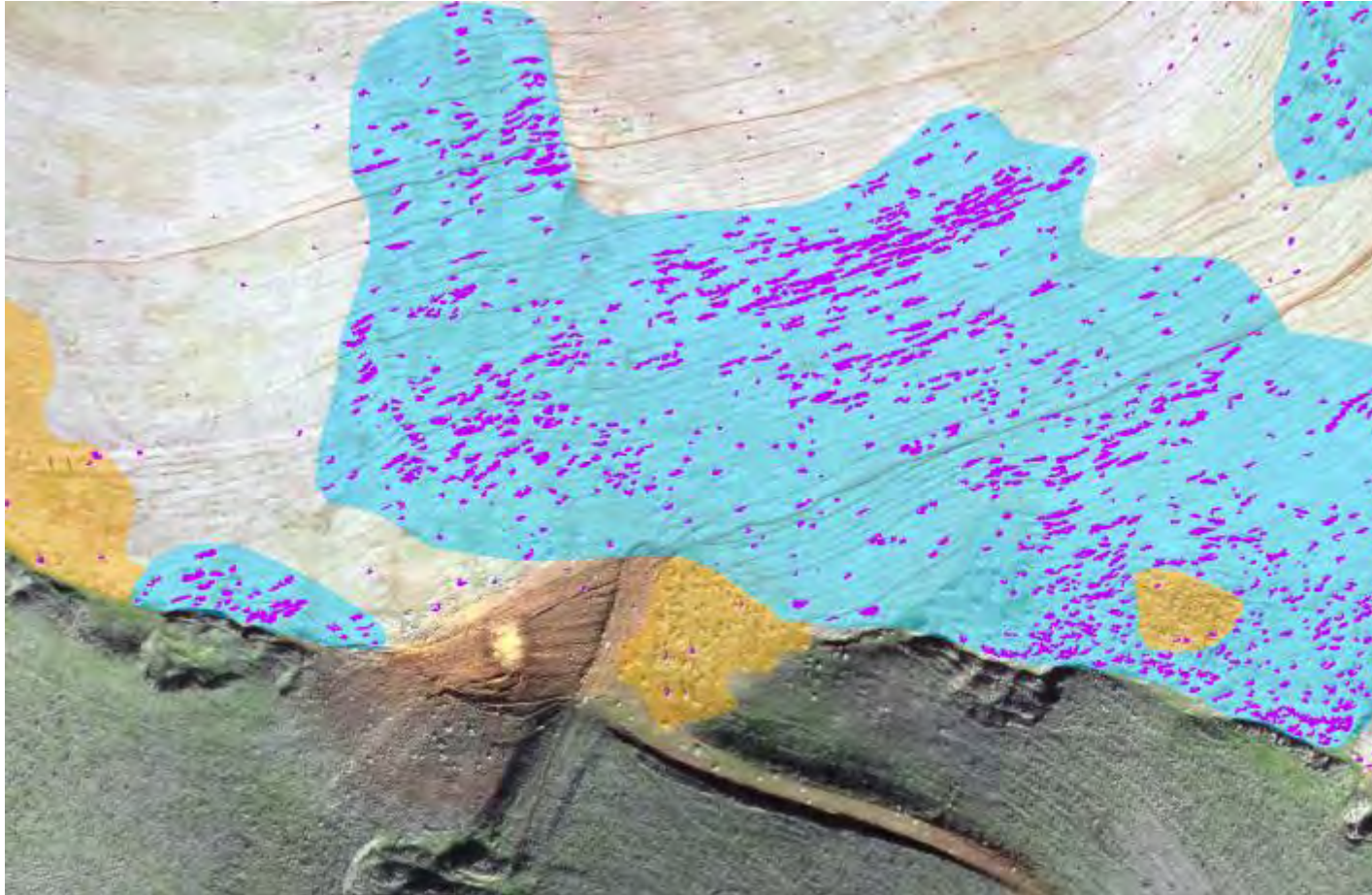
Treated Artichoke Thistle (eCognition)



Pre-treatment/Treatment Overlay



Post-treatment/Treatment Overlay



Post-treatment Artichoke Thistle



Sample Projects: MOTCO Multi-annual Pepperweed Mapping



Sample Mapping Area (RGB)



Sample Mapping Area (NIR)

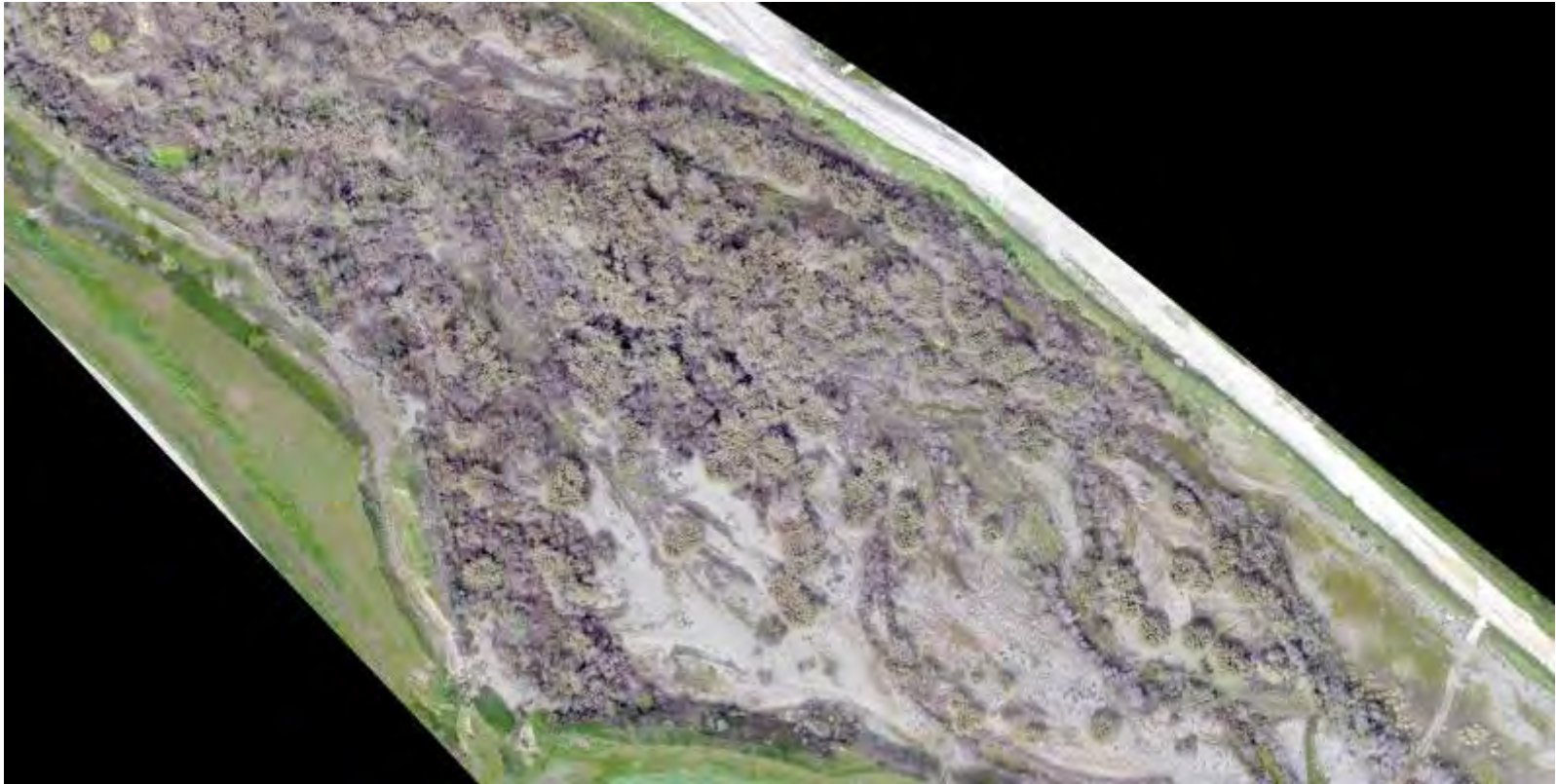


Pepperweed Populations



Sample Projects: Eliot Quarry

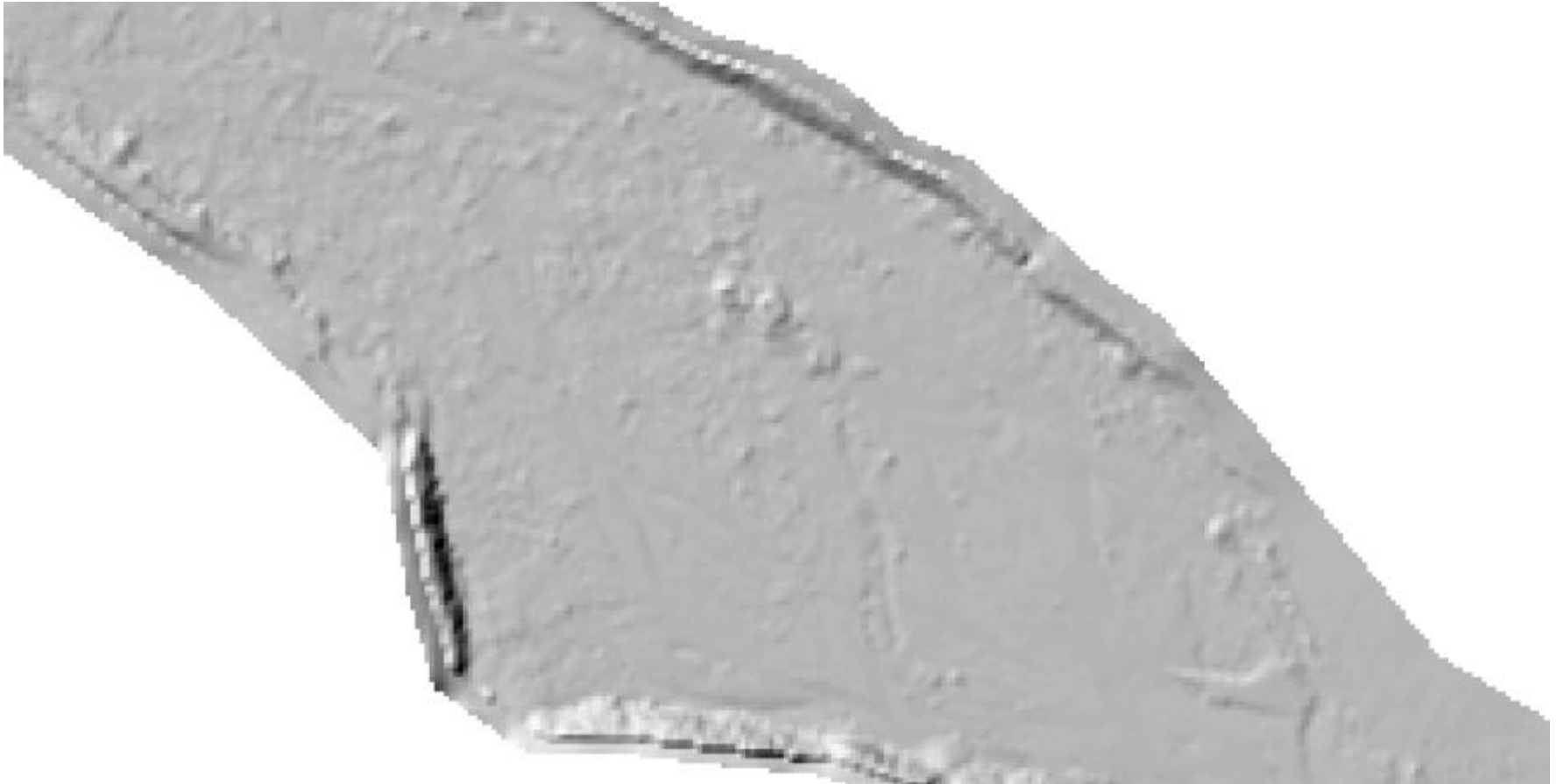
Arundo Mapping along Creek Corridor



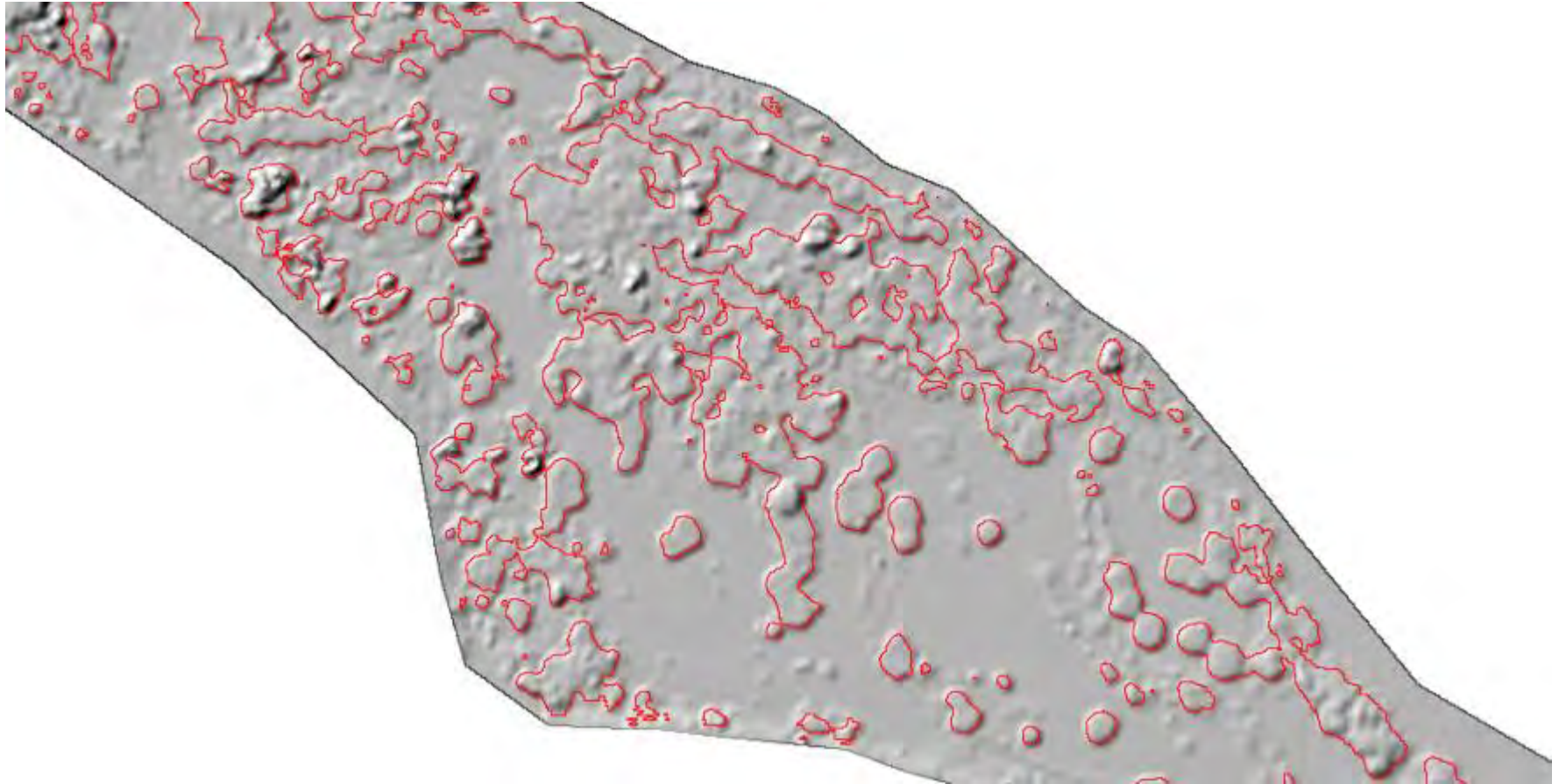
DSM (Digital Surface Model)



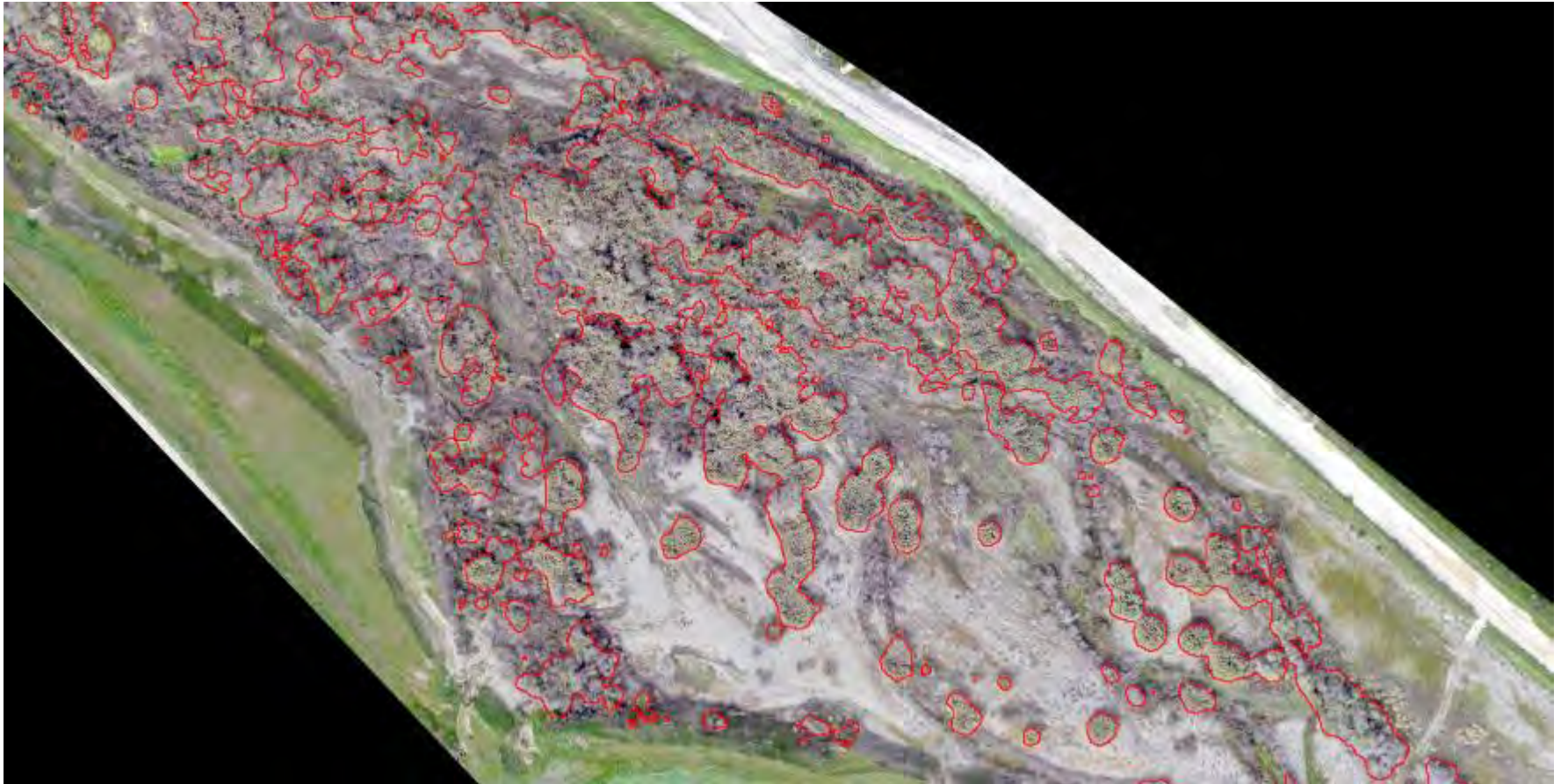
DTM (Digital Terrain Model)



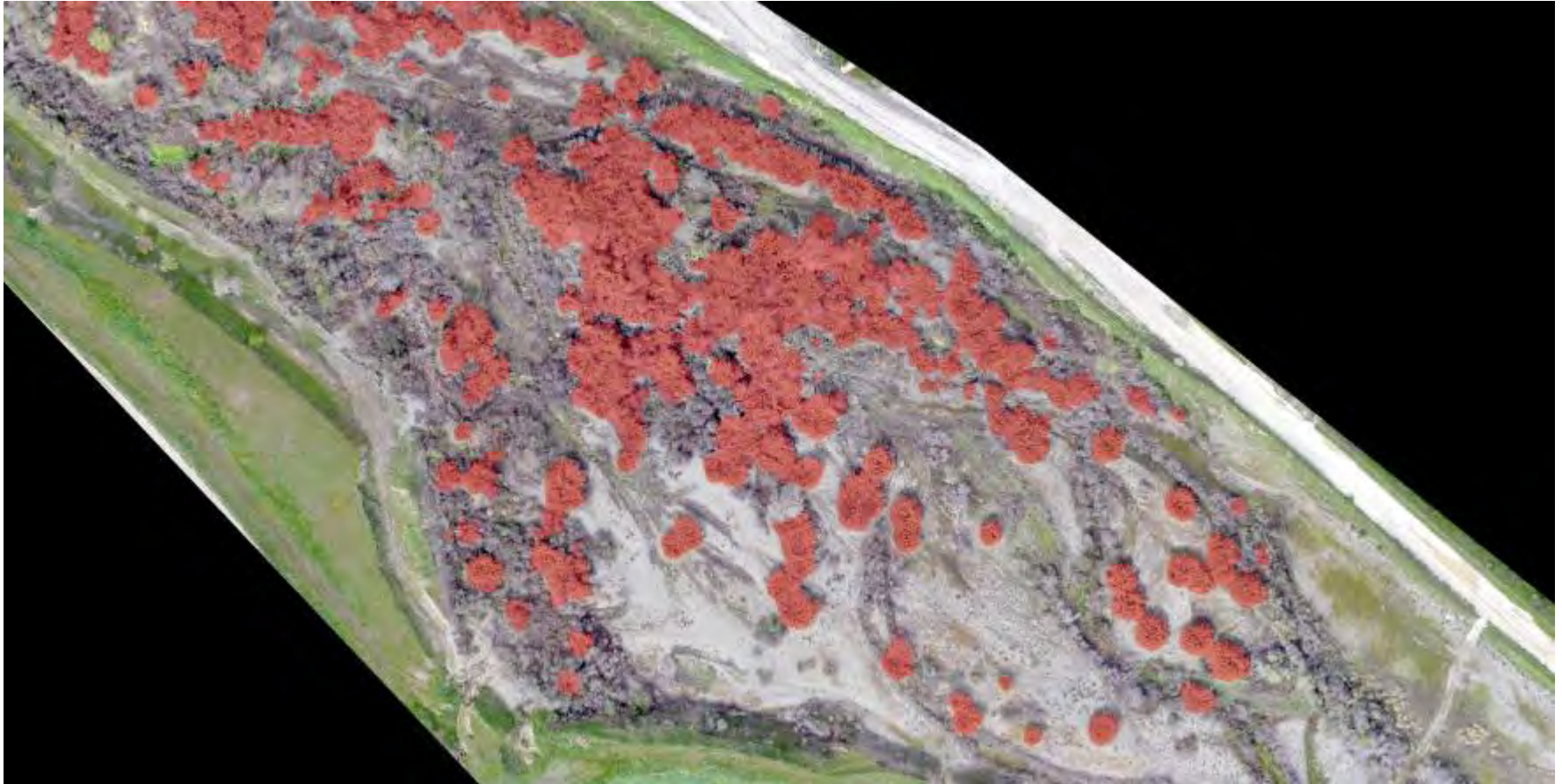
nDSM (Normalized Digital Surface Model) Tall Vegetation Extract (Arundo and Willow)



Tall Vegetation Overlay



Final Arundo Mapping (Willow Excluded)



Results

- Traditional mapping efforts were found to be expensive, inaccurate, and access can be restricted
- UAV technology provided a cost effective and highly accurate platform for acquiring data for analysis
- Repeat studies are easy to perform with pre-programmed flights
- Methodology between studies is consistent
- Multiple data outputs allows for different types of analysis

Thank You!

