

Unmanned Aerial Vehicles in Forest Management

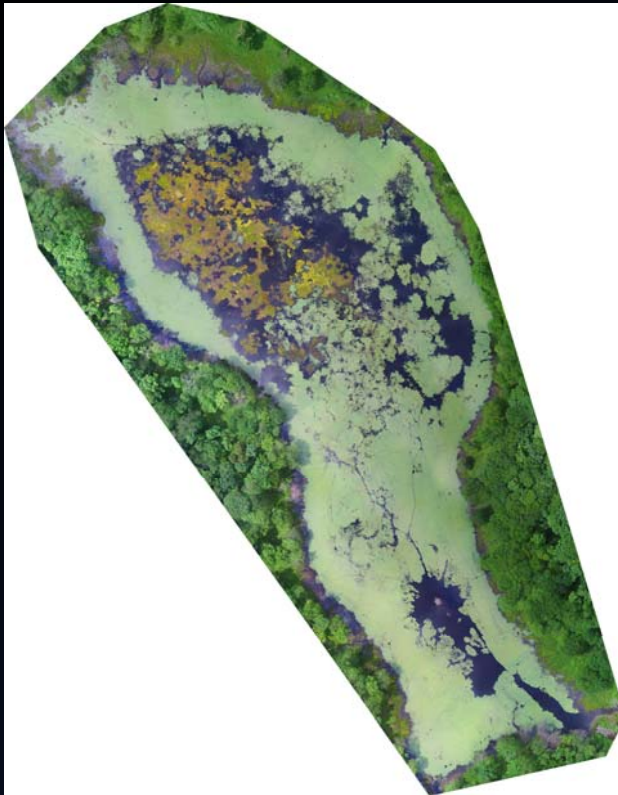
UAS – DRONE TECHNOLOGY



UAS (Drone) Technology Is USEABLE

- Unmanned Aerial Systems have matured
- Software and Analysis Systems have matured
- Commercial Use is now LEGAL and Legitimized





Professional-Grade Applications

NOT JUST FOR HOBBYISTS OR
PRETTY PICTURES ANY MORE



Benefits of Drones to Professionals

- Current Conditions
- Rapid, High Resolution Analysis
- Economical
- Safe
- Integrates with Existing Systems



Potential Uses in Forest Management

- Habitat Mapping
- Fire Surveillance
- Defoliation Mapping
- Storm Events
- Forest Management
- Monitor Forest Conversion
- Search & Rescue
- Wildlife & Recreation Surveys



Potential Uses in Forest Management

- Habitat Mapping
- Canada Run Bog Natural Area - DCNR



Potential Uses in Forest Management

- Fire Surveillance



Potential Uses in Forest Management

- Defoliation Mapping
- Emerald Ash Borer Mortality



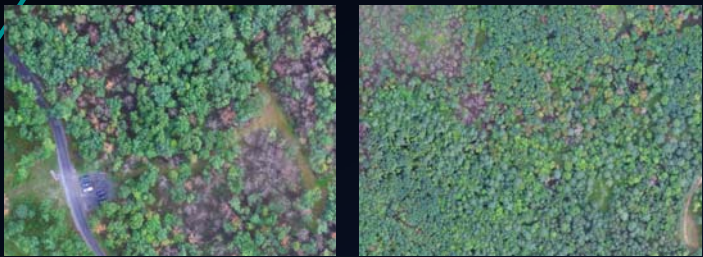
Potential Uses in Forest Management

- Forest Management
- Timber Harvest



Potential Uses in Forest Management

- Forest Management
- Prescribed Burn



Potential Uses in Forest Management

- Monitor Forestland Conversion – Track Change
- Natural Gas Development

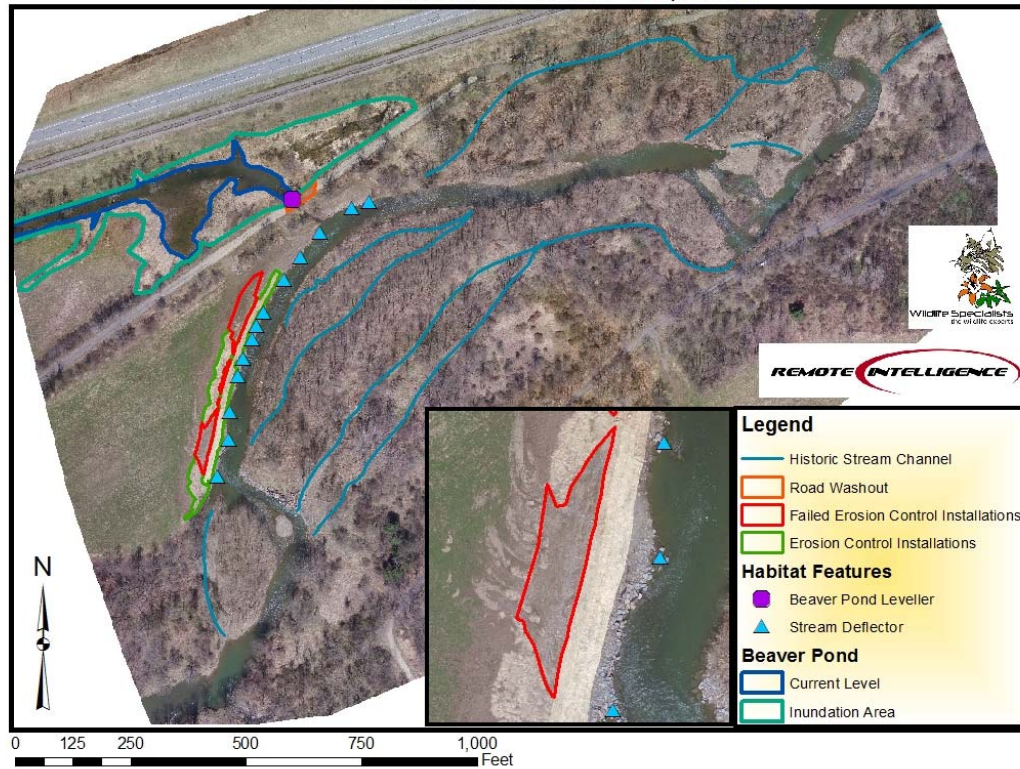


Monitoring

- TIME SERIES



Crooked Creek Habitat Features - 13 April 2016



Potential Uses in Forest Management

- Search & Rescue



Potential Uses in Forest Management

- Wildlife & Recreation Surveys



Potential Uses in Forest Management

- Wildlife & Recreation Surveys



Output Products

- Stabilized Video
- High Resolution Still Imagery
- Thermal
- Multispectral - NDVI
- Orthomosaics
- Imagery Analysis Models
- 3d Models – LIDAR – Viewshed Analysis
- Topographic Contours



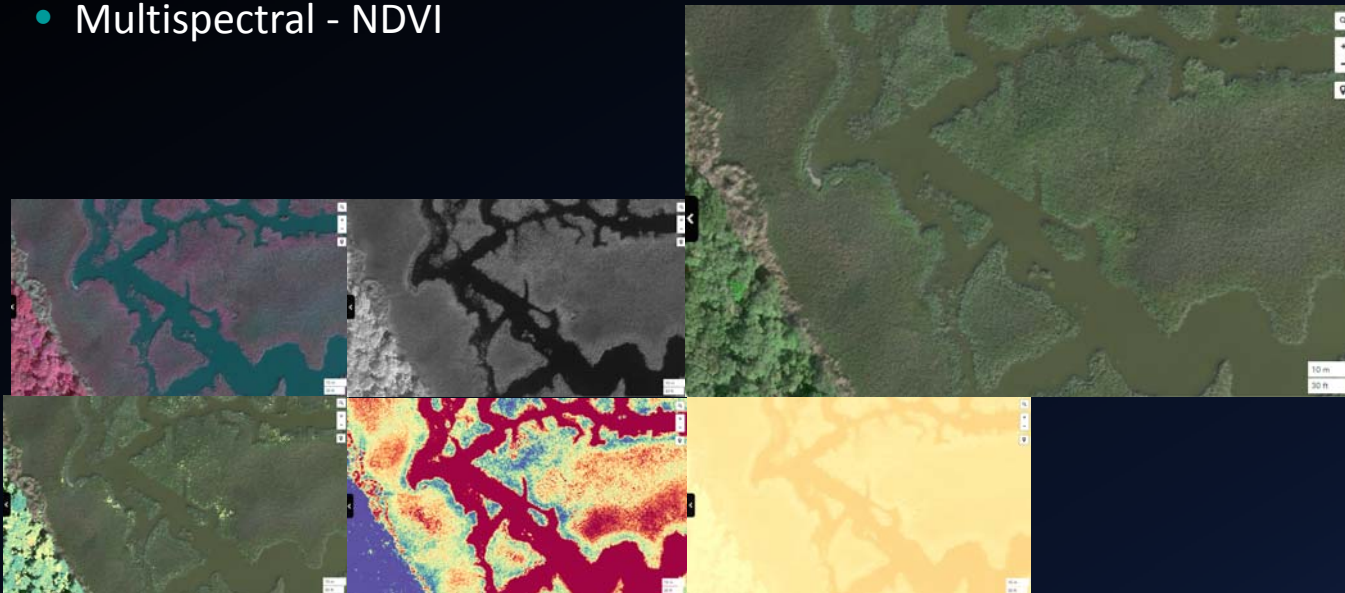
Output Products

- Stabilized Video



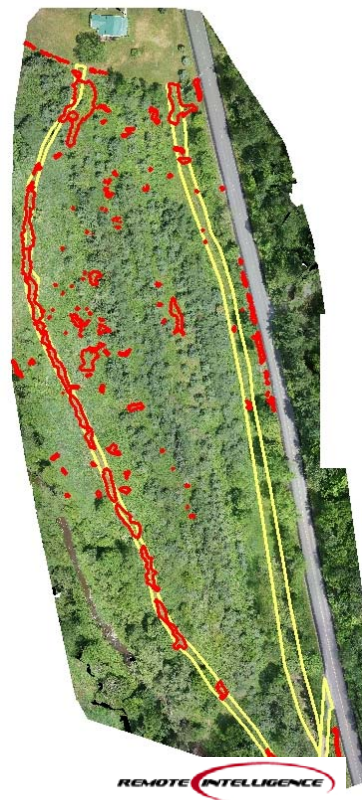
Output Products

- Multispectral - NDVI



Output Products

- Orthomosaics
- Imagery Analysis Models
- Invasive Plants



REMOTE INTELLIGENCE

Output Products

- 3d Models – LIDAR – Viewshed Analysis



Output Products

- Topographic Contours



Output Products

- Google Earth Overlays



Steps to Productivity using UAS

- Pre-Plan
 - What products are needed?
 - What systems & sensors?
 - Flight planning:
 - Project boundaries
 - Ground Control
 - Airspace/regulatory
 - Air Traffic
 - When is the best time to get imagery?
 - Rain dates
- Quality Control

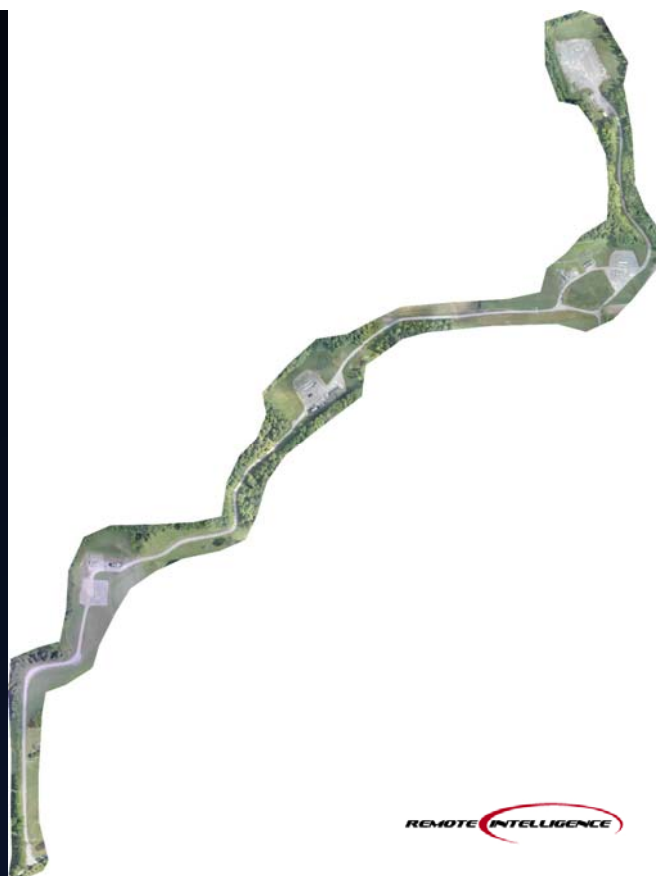
Flight Planning,
Ground Control
Points, Logistics

Aerial Imaging

Processing/Analysis

Considerations & Recommendations for Data Acquisition

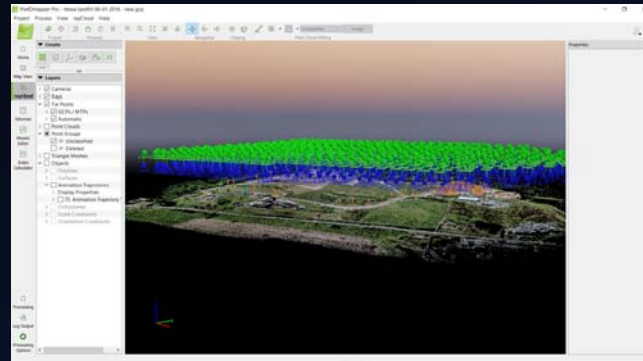
- Timing of Survey
 - Bare Earth
 - After Mowing
 - Snow Cover
- Ground Control Points
- Selection of Service Provider
 - Legal?
 - Insured?
 - Experienced?



The Process

FLIGHT LINES TO CAPTURE
IMAGERY

INITIAL ANALYSIS –
AUTOMATIC TIE POINTS

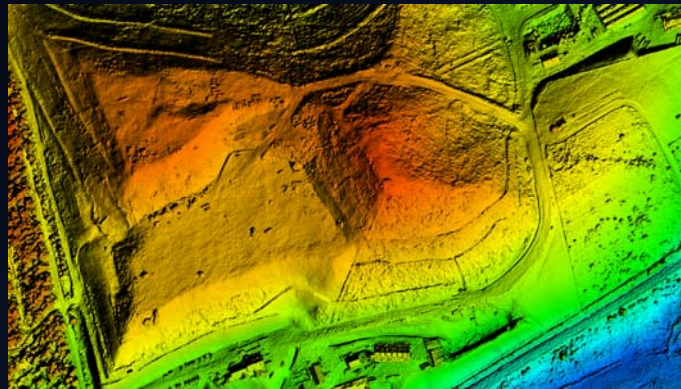


The Process

GENERATE 3D POINT CLOUD



DIGITAL SURFACE MODEL -
DSM



The Process

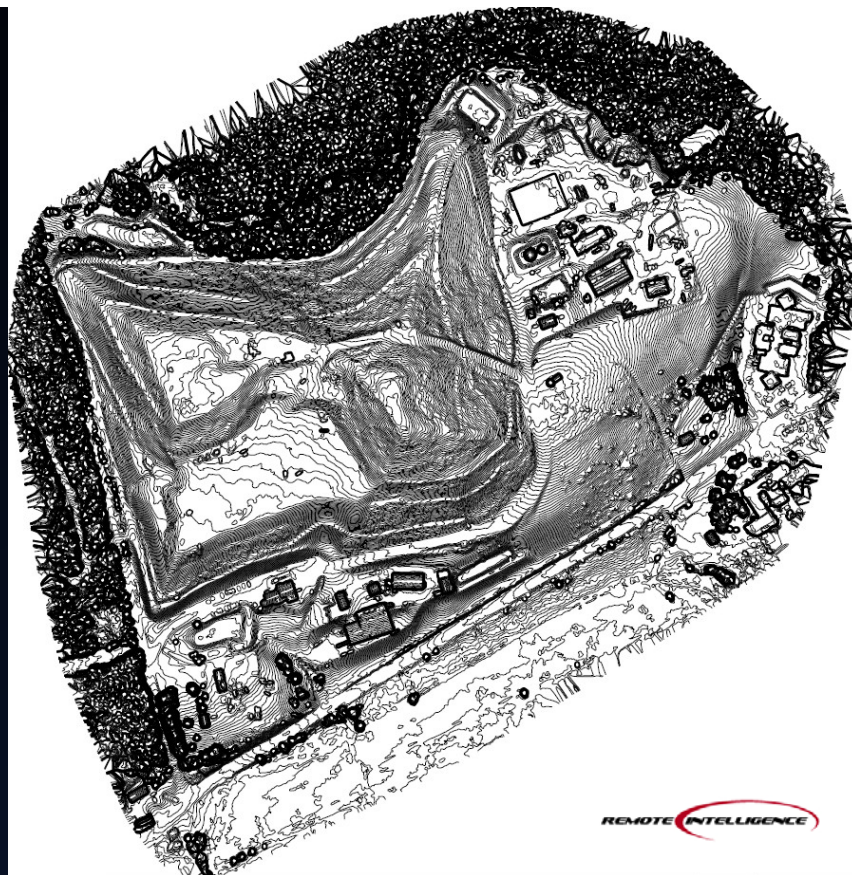
ORTHOMOSAIC –
POTENTIAL
RESOLUTION TO
1 CM



The Process

GENERATE
TOPOGRAPHIC
CONTOURS –

SELECT INTERVAL
BASED ON POINT
CLOUD RESOLUTION
AND PROJECT
NEEDS

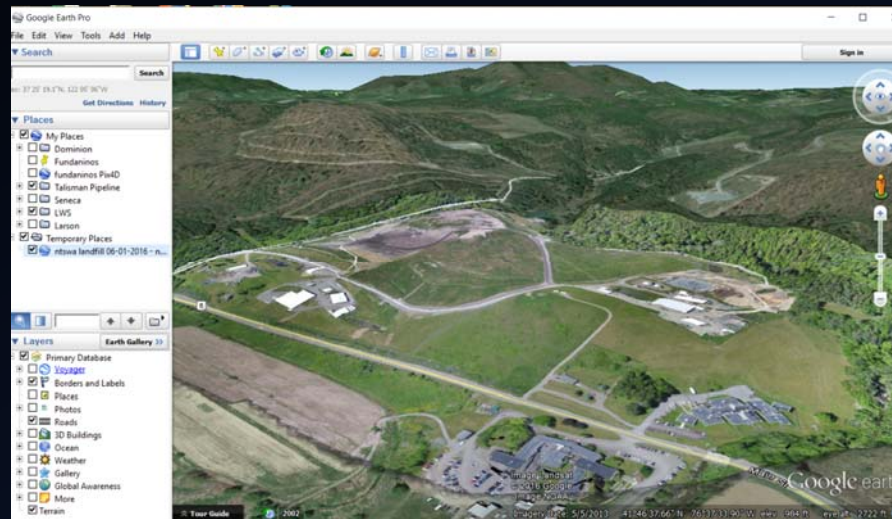


Additional Outputs

GOOGLE
EARTH KML

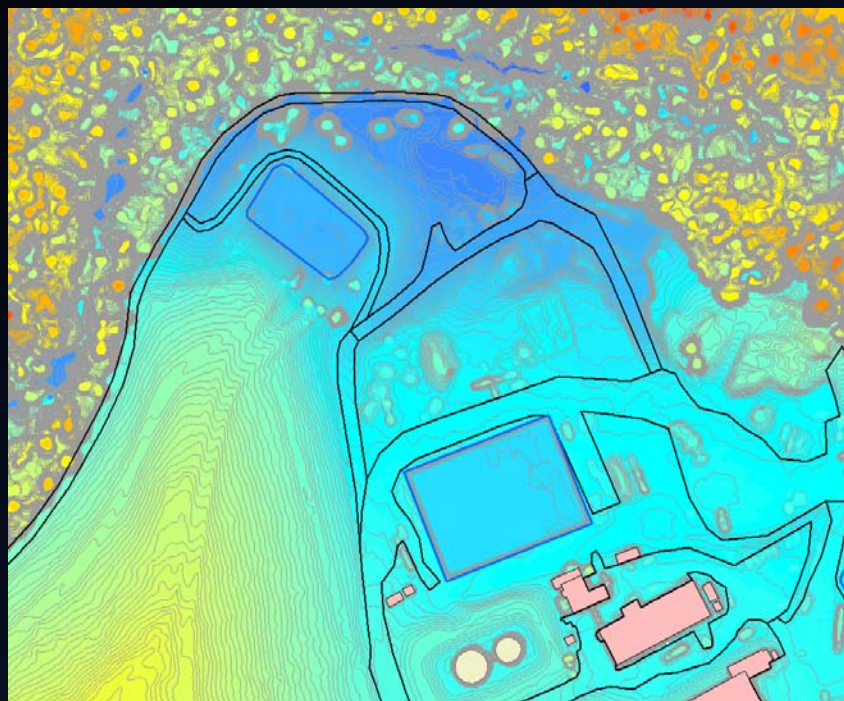
3D PDF

OBJ – FOR 3D
PRINTING

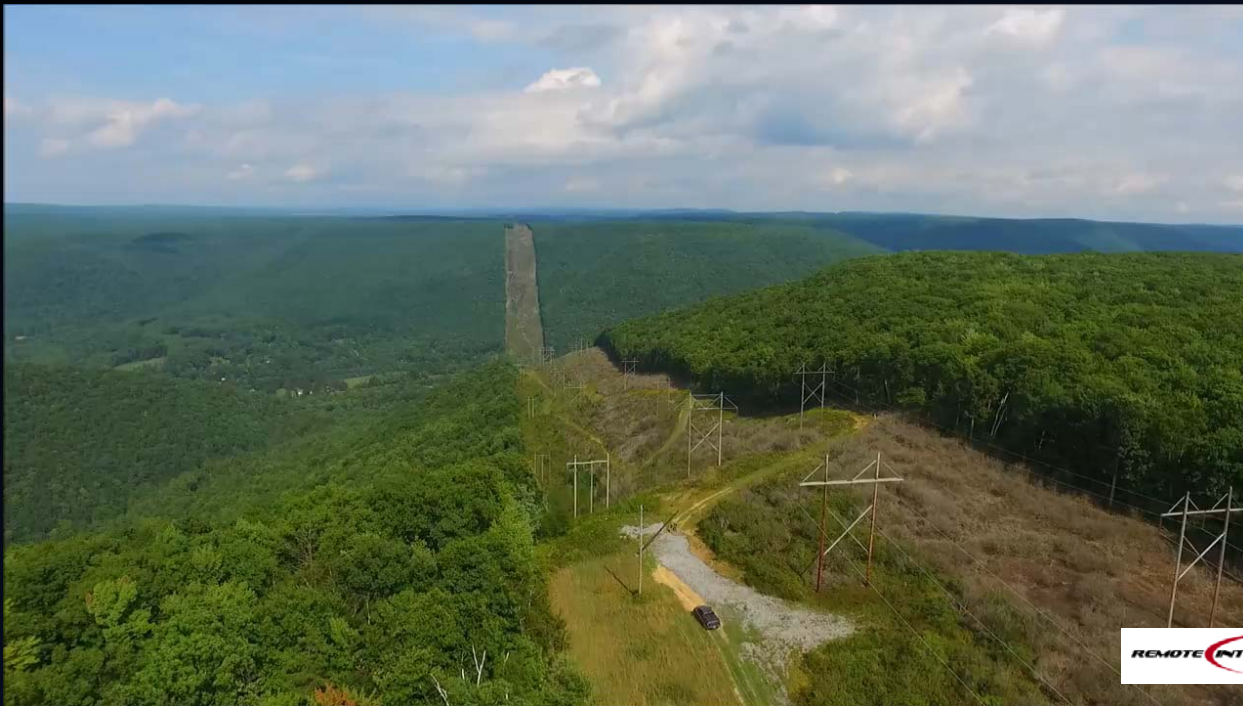


Data Analysis

GIS –
OVERLAY
EXISTING
DATA LAYERS
OR CREATE
NEW



Linear Right-of-Way Mapping



Considerations on Who Should Fly? In-house vs. Outsourced

- Systems
 - Updated, maintained
- Regulatory Requirements
 - Pilot's License for Remote Pilot of SUAS
 - Airspace Approvals
- Aviation Insurance
- Analysis Software
- Processing Experience



