Monitoring Opportunities in the Estuary with Unmanned Aerial Vehicles (UAVs)

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Key Lines of Inquiry and Application

Current Aerial Imagery
- High Resolution

Vegetation Communities
- Weed Mapping: Reed Canarygrass, Yellow Flag Iris and Purple Loosestrife
- Reed Canarygrass Treatment Effectiveness
- Planting Success

Land Surface Change
- Construction As-Built Documentation
- Mound Dimensions

Channel Network and Dimensions
- Planform Channel Metrics & Development
- Cross-Sectional Dimensions

Large Wood Resources
- Large Wood Presence
- Large Wood Metrics
- Beaver 'Starter Structures' Use

Cost Effectiveness/Work Efficiency/Data Quality

Kandoll Farm Restoration Site – Grays River – Wahkiakum County, WA

- 163 Acres restored in fall 2013
- Three miles of tidal channels
- Topographic mounds
- Weed control and native vegetation community restoration

Logistics

Two flights: Feb and May 2016

10 targets placed and surveyed

2,363 photos taken along pre-programmed route

Image Analysis

- Orthoimagery (2.5 cm resolution)
- Digital Surface Model (10 cm res)

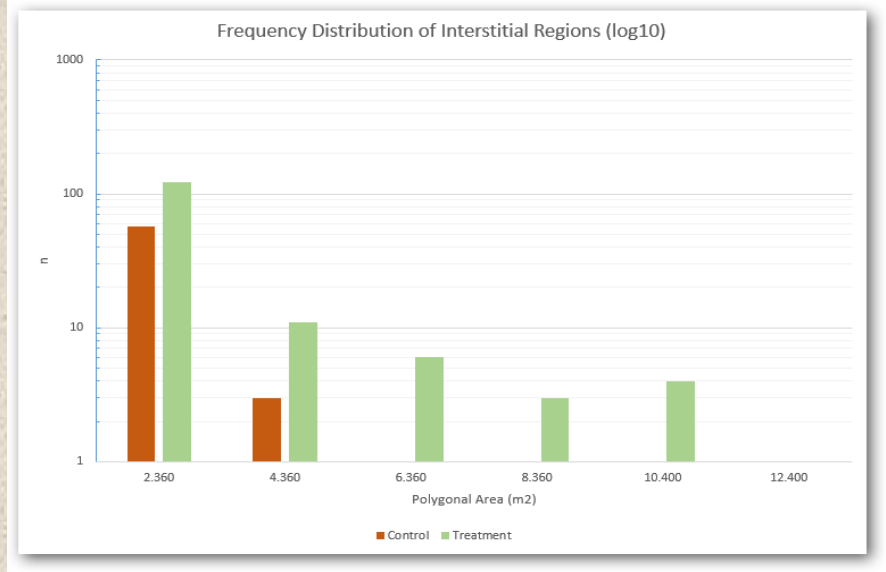
Technical Brief


2011 NAIP


2015 NAIP




Image Segmentation and Classification



Control Area

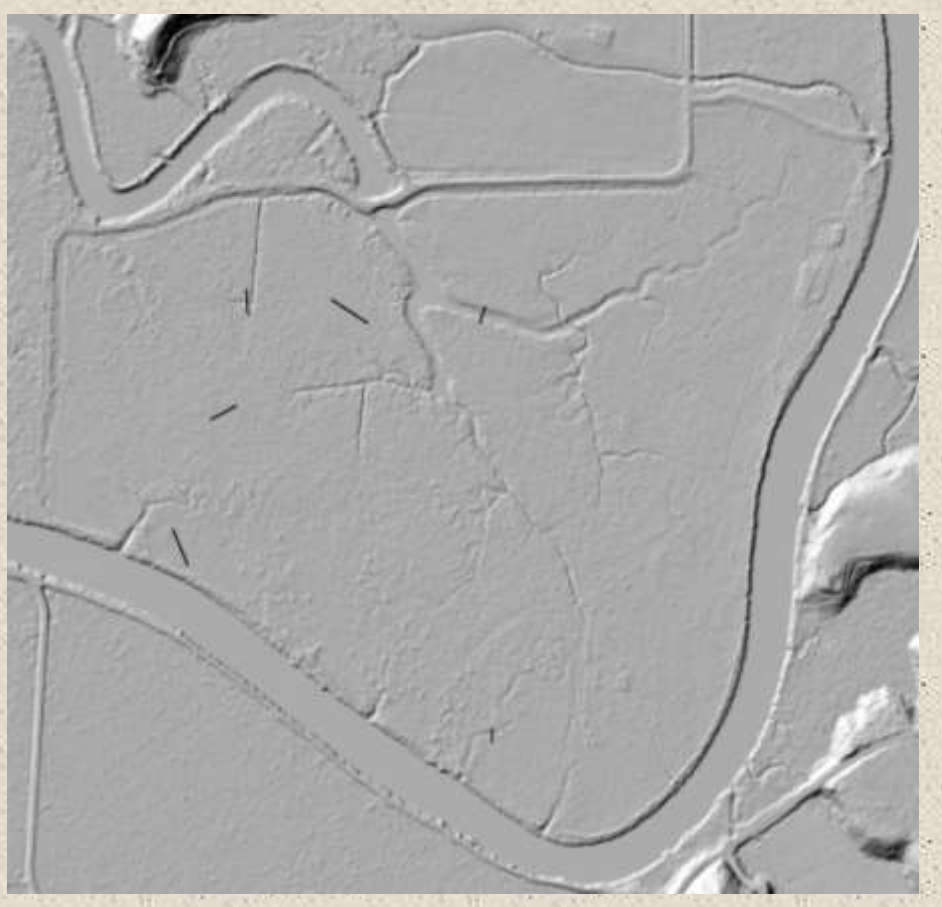
Treated Area

Treated in 2013: Glyphosate wick application

Control Area: 61 Identified interstitial polygons totaling 59.58 m^2 or 2.85%

Treated Area: 151 Identified interstitial polygons totaling 347 m^2 or 16.6%

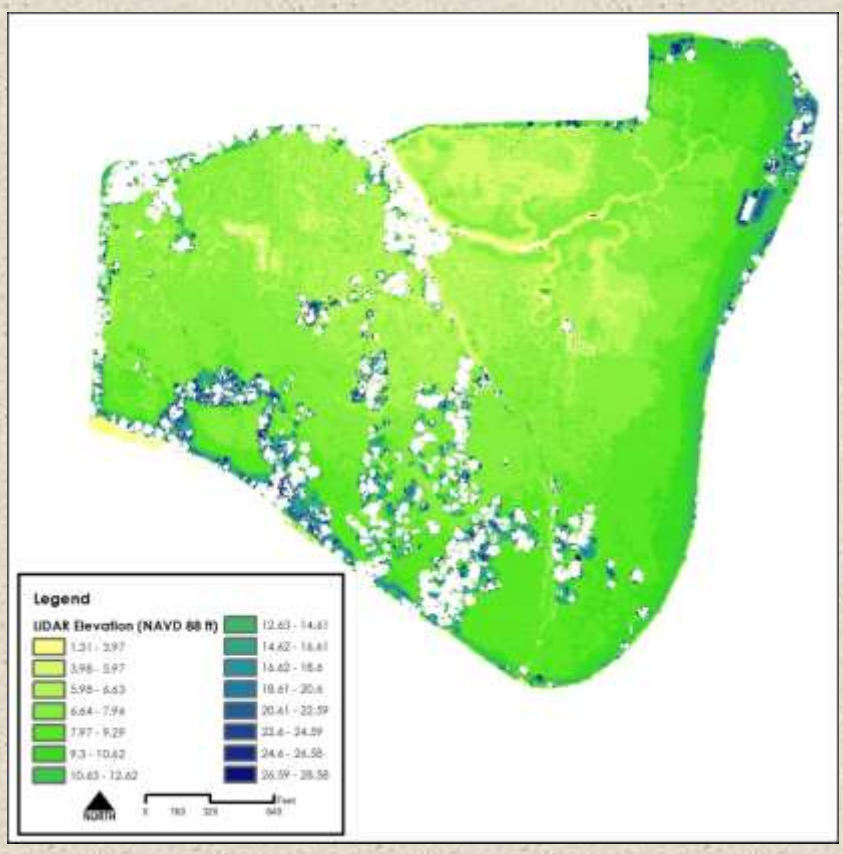
Land Surface



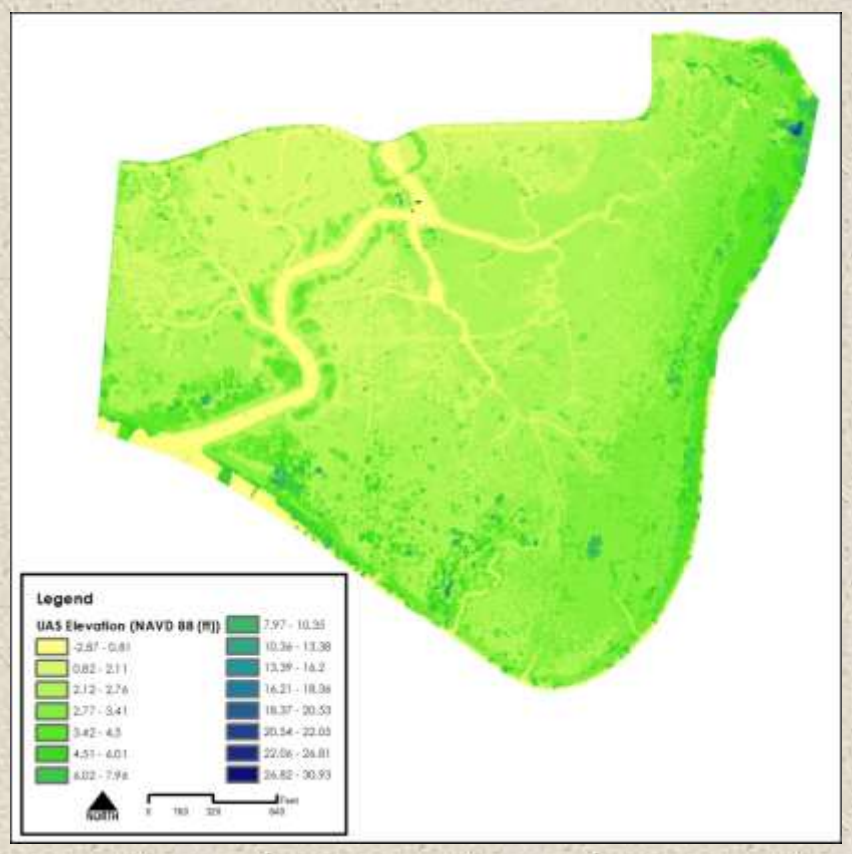
2010 LIDAR

2016 Land Surface

Land Surface Analysis

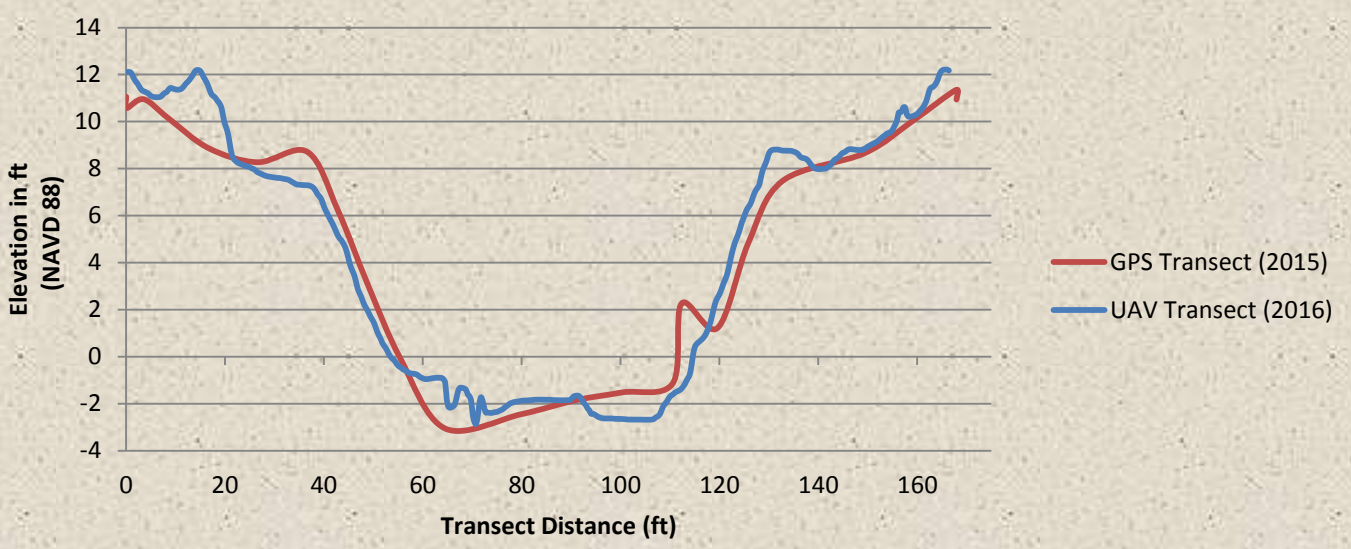


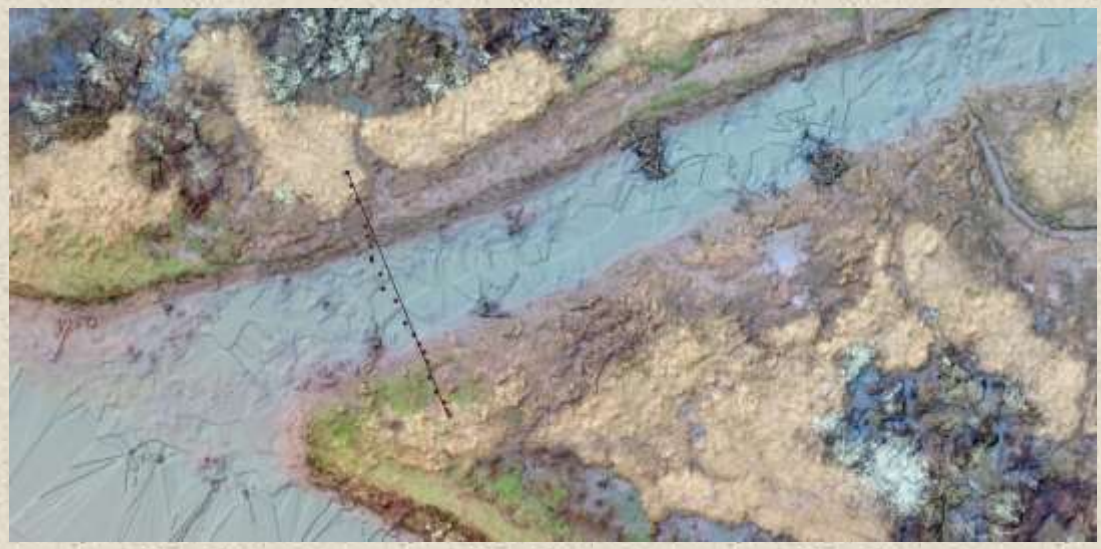
2010 LIDAR



2016 Land Surface

Channel Cross-Section Comparison





Summary of Findings ✓

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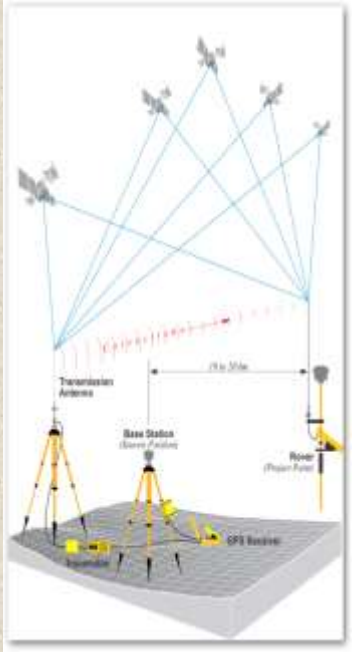
Disruptive Technology

- UAS Platform
  - Fixed wing airframe vs. copter
  - GNSS
  - IMU
  - RGB, multi-spectral, thermal, LIDAR, 4k video
  - Remote controller
- RTK
  - GNSS L1/L2 Base and rover or CORS + rover
  - 1-2cm horizontal accuracy
- SfM
  - Georeferenced 2D, 3D, data products



Regulatory Framework

- UAS operate in the NAS, and fall under the regulatory authority of the FAA
- Definition of “Commercial Use”
- Public entities require a COA, private entities and individuals S333 + COA
- Blanket COA recently modified by FAA to 400’ AGL
- Airman certificate
- Small UAS only (55 lbs or under), and must have an FAA “N-number”
- Operate under Visual Flight Rules (VFR) and PIC must maintain VLOS
- No flight operations within:
  - 5nm of an airport with an operating tower
  - 3nm of an airport with a published IFR procedure but no operating tower
  - 2nm of a heliport or VFR airport and no operating tower
  - COA will impose additional operating restrictions
- FAA is stepping up fines for regulatory violations

Strengths & Limitations of UAS

- Flexibility
- Safety
- Cost
- Resolution
- Timing
- Coverage
- Terrain limitations
- Surface model


Questions?