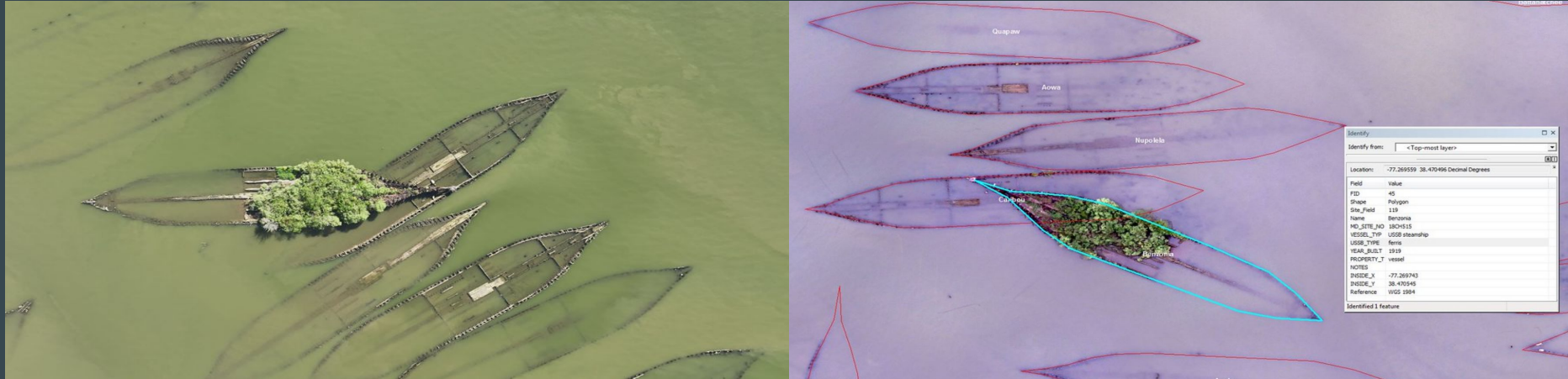


Mapping the “Ghost Fleet of Mallows Bay” Using Drone-Based Remote Sensing



Images Source: White et al., 2025

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Paper by White, Seymour, Dale, Newton & Johnston
Duke University – Marine Robotics & Remote Sensing Lab
Published in Scientific Data (Nature Research)

Purpose of the Research

Why this research was needed:
Mallows Bay has 100+ World War I shipwrecks.

These ships are slowly changing due to:

- rising water levels
- sediment build up
- vegetation growing inside them
- natural decay

Researchers aimed to create high resolution maps and 3D models to document the current condition of the Ghost Fleet.

Create a baseline so scientists can track changes over time.

Supports history, archaeology, and ecology

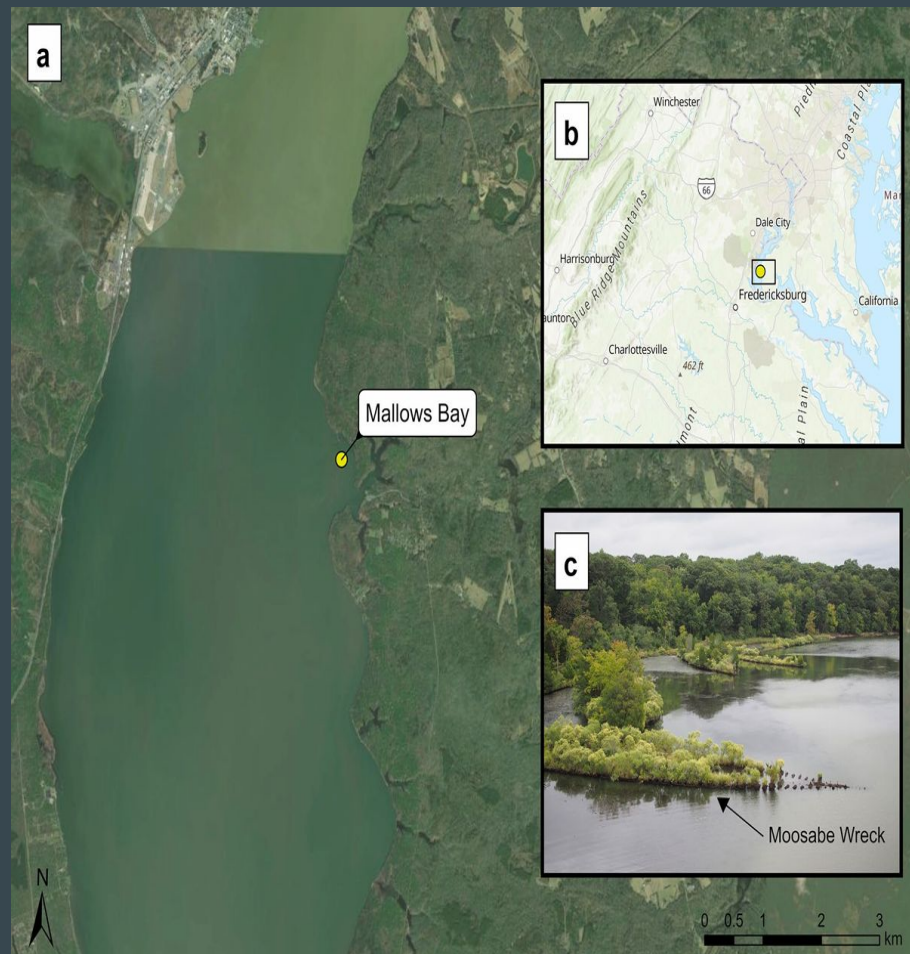


Figure 1. Location and imagery of the Ghost Fleet of Mallows Bay (White et al., 2025).

Methods (Drones, Imagery, Dates)

Drone 1 - Regional survey

Whole bay

senseFly eBee (fixed-wing)

RGB photos (Canon S110 camera)

521 images

3.5 cm/pixel

100 m altitude

38 hectares mapped



Image Source: White et al., 2025 (senseFly eBee)

Drone 2 - High Resolution

Single shipwreck (Benzonia)

FreeFly Cinestar 6

RGB photos (Olympus E-PM2)

92 images

0.6 cm/pixel (very high resolution)

36–40 m altitude

11 min flight



Image Source: White et al., 2025 (FreeFly Cinestar 6)

Drone 3 - Video

Oblique (side-angle) video

3DR Solo

20–50 m altitude

Used for ship structure details

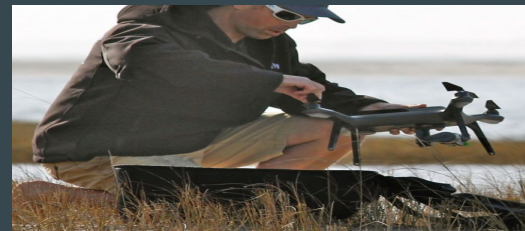


Image Source: White et al., 2025 (3DR Solo)

Date: September 20, 2016 (all drone missions done on same day)

Software: Pix4D (orthomosaic, DSM, DEM, 3D), ArcGIS Pro

Results

1. High-Resolution Orthomosaics

- Regional orthomosaic of all 147 shipwrecks
- Very sharp imagery (3.5 cm/pixel & 0.6 cm/pixel)

2. 3D Models & Elevation Products

- Digital Elevation Models (DEM)
- Digital Surface Models (DSM)
- Show shape, height & condition of wrecks

3. Digitized Ship Outlines

- Researchers traced each ship in ArcGIS Pro
- Created polygons + centroid points for every wreck
- Included historical attributes (name, date built, type)

4. Mapped Ecological Patterns

- Showed vegetation growing on/around wrecks
- Identified areas of sediment buildup
- Helped document early signs of deterioration

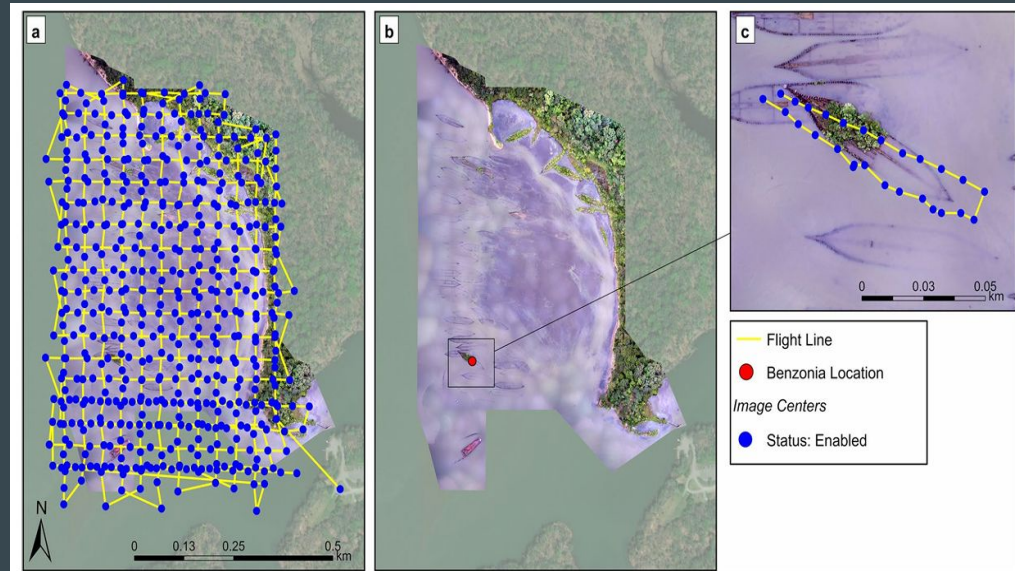
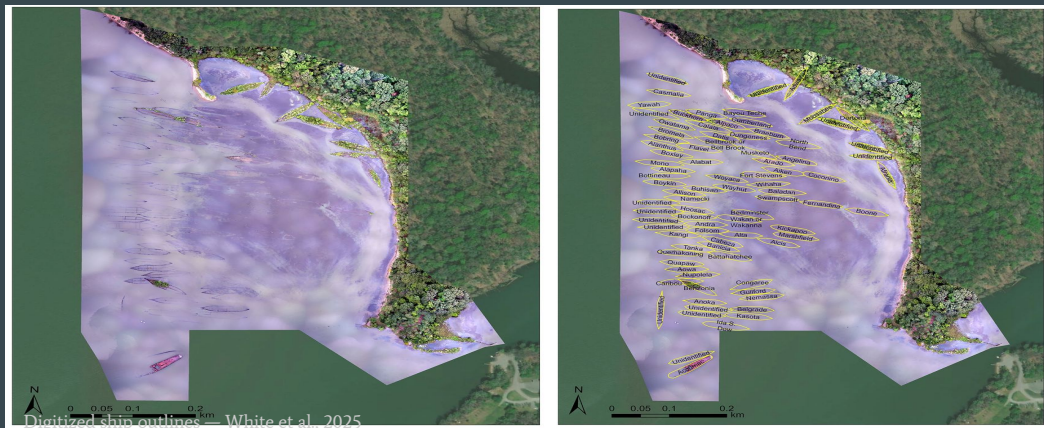


Fig. 3 Orthomosaic of the Ghost Fleet — White et al., 2025



Digitized ship outlines — White et al., 2025

Other Applications of Drone-Based Remote Sensing

Drone-based remote sensing can also be used for:

- **Archaeology**
Mapping ancient sites, buried structures, and cultural landscapes
- **Environmental Monitoring**
Tracking wetlands, forests, erosion, invasive species, and wildlife habitat changes
- **Coastal & Flood Studies**
Mapping shoreline erosion, sea level rise, and storm damage
- **Disaster Response**
Assessing damage after hurricanes, wildfires, and floods
- **Urban Mapping & Planning**
Creating updated basemaps, 3D models, land-use planning, and infrastructure inspections
- **Construction & Engineering**
Site monitoring, volumetric measurement, and progress documentation

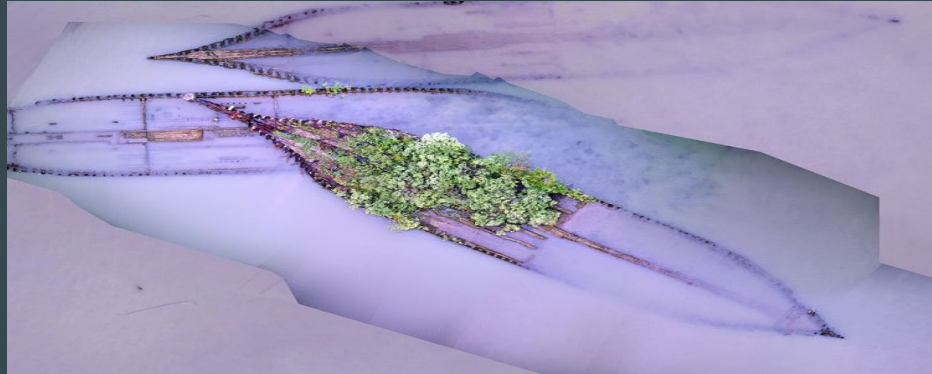


Image Source: White et al., 2025