Using UAV Technology to Enhance Long-term Coastal Monitoring

Merrimack Valley Planning Commission

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Merrimack Valley Planning Commission
Plan • Innovate • Promote

Massachusetts Bays NATIONAL ESTUARY PARTNERSHIP

Project Goals

This project sought to utilize UAV technology to document and quantify degradation and opportunities for restoration of coastal habitat in Northeastern Massachusetts.

Through integrating UAV technology into three established long-term monitoring programs, the project assessed new methods to improve efficiency, consistency, and effectiveness

Pilot Projects:

Marsh Edge Erosion
The lateral loss of marsh along the seaward edge

Chronic Marsh Wrack
Deposition of dead natural plant material along barriers

Eelgrass Restoration
Identifying suitable locations for future eelgrass restoration

Marsh Edge Erosion

- Monitoring ongoing since 2014
- 19, 50-m locations assessed annually
- Methods:
  - Measuring distance to edge at 3 points using meter tape and azimuth
  - Real-Time Kinematic and Global Positioning system (RTK-GPS) mapping
- Identified loss and variation across sites, but limited

Chronic Marsh Wrack

- Monitoring begin in 2022
- Sites throughout the Great Marsh
- Methods:
  - Handheld mapping
- Identified chronic sites and change, but time consuming and limited data

Eelgrass Restoration

- Active restoration in GM since 2014
- Numerous habitat assessments completed. Require frequent and time consuming site assessments
- Variables
  - Sediment stability
  - Depth (water line)
  - Hydrology

- Time intensive and access challenges

Healthy Estuaries | UAV Coastal Monitoring

Introduction

Using UAV Technology to Enhance Long-term Coastal Monitoring

The **Great Marsh** is the largest contiguous saltmarsh habitat in New England, spanning from the north shore of Massachusetts up through the southern coast of New Hampshire. It is considered critical habitat for many coastal species of wildlife and vegetation, including migratory birds. For decades, the marsh has been on foot and by boat, using hand-held techniques to track long-term conditions and keep a careful eye on its health and possible dangers to the ecosystem.

In 2024, the Merrimack Valley Planning Commission (*MVPC*) acquired funding from the Massachusetts Bays National Estuary Partnership (MassBays) Healthy Estuaries Grant to integrate remote sensing techniques using unmanned aerial vehicles (*UAVs; drones*) to test the efficacy of such devices in coastal monitoring. This plot study tested the drone's capabilities alongside normal manual techniques in three well-known and long-standing monitoring studies

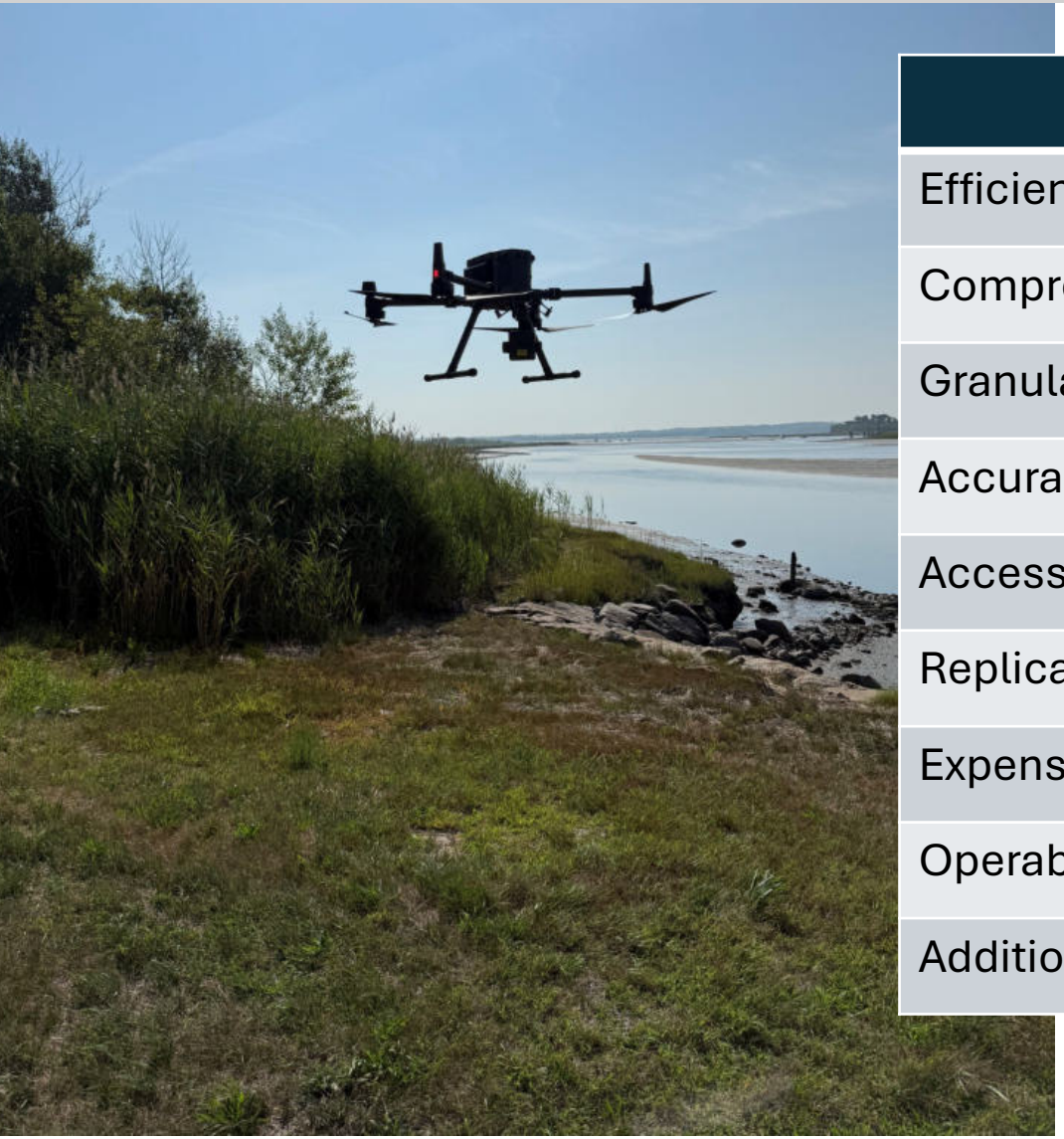
MARSH EDGE EROSION is monitored using measurements from an established marker to the lateral edge of the marsh along a standard azimuth. Drone LiDAR technology is trialed as a way to monitor larger strips of marsh and identify places of high erosion.

MARSH WRACK DEPOSITION is measured by walking the edge of the marsh wrack mat to create a field surveyed boundary. In contrast, the drone can acquire imagery of the entire mat, allowing a user to identify wrack at a larger scale from the air.

EELGRASS RESTORATION sites are identified using a suite of conditions to understand factors such as hydrological patterns, changes in sediment, depth, etc. A drone can fly a large area to comprehensively assess regional conditions, saving experts time on foot.

Choose a study below to begin exploring the data.

Success of UAV Integration



	Field Method	UAV
Efficiency	-	+
Comprehensiveness	-	+
Granularity	-	+ (2-10cm resolution)
Accuracy	-	+ (less user error)
Accessibility	-	+
Replicability	-	+
Expense	+	-
Operability	+	- (licenses and weather)
Additional Data	+	-

Thank you!

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