Connecticut Invasive Plant Working Group

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Connecticut

Cove River

West Haven

Osprey

Viability and Utility of µUAS for wetland monitoring

µUAS Research @ Cove River Historical Site - SaltMarsh

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processed with Pix4D Mapper Pro

Osprey µUAS is a Pilot Research program focused on determining the viability and utility of engaging *µUAS* (micro drones) for coastal wetland monitoring, mapping, and 3D Modeling. The selected Study Site is the middle section of the lower Cove River Estuary, West Haven, CT. This section of salt marsh was treated with herbicide and mulched with a bulldozer in 2012 to eradicate the invasive *Phragmites*. Our hypothesis is that native marsh grasses (*Spartina* and others) would recolonize the marsh top and channel margins. Unfortunately, that has not happened to the extent and/or rate anticipated at this location. It appears that the current marsh-top may be deflating and the channel margins appear to be collapsing in places. Some of these aspects may well be documented and visualized using *µUAS* overflights and employing Image Mosaics and 3D Modeling software (Pix4D Mapper).

Future/follow-up Research and Data Collection: Conducting precision ground surveys (Total Station and stadia rods) would help establish ground control points for the *µUAS* mapping flights, as well as establish the elevation of the marsh top. On-ground marsh top, channel bank, and channel floor sediment sample analyses would help to resolve whether channel banks are collapsing. Measuring marsh top inundation depth can be achieved by anchoring our newly developed time-lapse *Marsh Inundation Camera System* into the marsh top and imaging spring and neap high tide levels. Salinity data collected at high tides also helps in resolving the conditions that may be preventing normal marsh top vegetation (*Spartina Patens*) from returning.

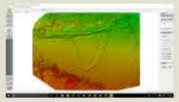
Recent Views of the Cove River Salt Marsh showing Eradication of Invasive Phragmites and Compromised Marsh
To-date, much of the marsh top remains a mudflat held together by the rotting *Phragmites* roots. Some limited *Spartina Alterniflora* have been established along the marsh channel banks, but in many areas the channel banks and marsh top remain un-vegetated. The fear is that without anchoring vegetation, the marsh top and channel margins will destabilize and deflate or collapse. Further, while many species of wetland/shore and wading birds have returned to the Cove River (including mallards, mergansers, egrets, herons, swans), a reinvigorated and healthy salt marsh is a long way off.

As we seek to understand how the marsh changes over time, we will document the vegetation aerial extent, the species present and those colonizing. We also intend on combining our aerial photo-mosaics and 3D models of the marsh area with ground-level observations and sampling of marsh top and channel bank and trough sediment characteristics. Further, we will be installing marsh top elevation measurement stations (*Marsh Inundation Camera System*). Finally, we plan on making observations of the marsh top and channels through a series of Spring and Neap Tidal cycles, with flow-rate monitoring and Salinity measures at select locales.

µUAS Piloting
Peter Broadbridge+

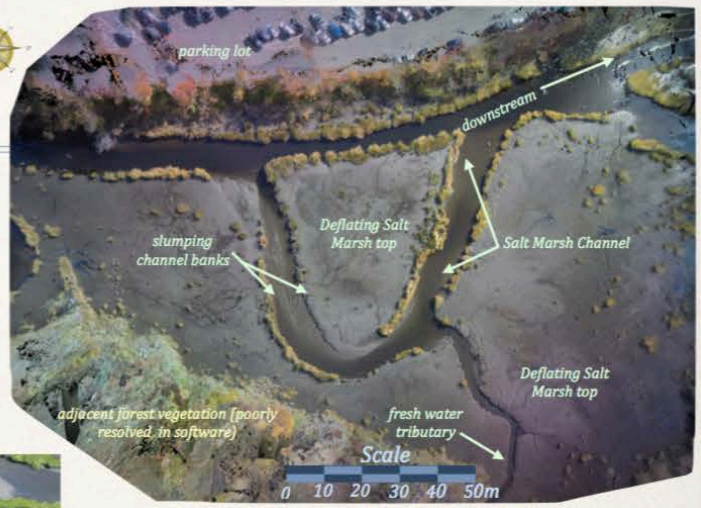
Ground Station App for Mission Planning

Panorama of Lower-Mid Cove River Estuary and Salt Marsh (April 16th 2016)

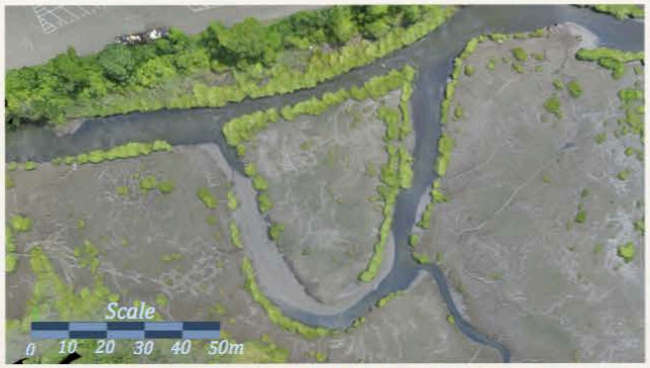


3D Model processed with Pix4D Mapper

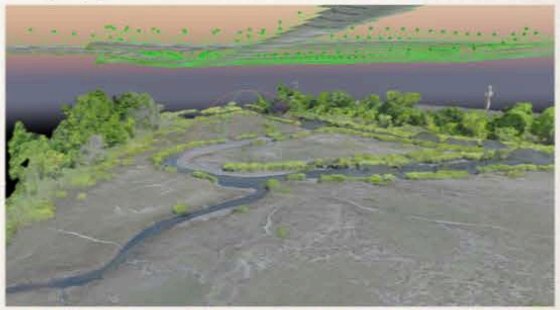
µUAS flight November 20th 2015, Time: 1345hrs, LowTide @ NHH: 1140hrs



µUAS flight March 20th 2016, Time: 1640hrs, LowTide @ NHH: 1400hrs



µUAS flight August 11th 2016, Time: 1218hrs, LowTide @ NHH: 1209hrs



Pix4D map/model rendering with µUAS flight path and camera locations above terrain

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