Bonus Session: Capturing the Coastline with Technology

Marshes and Beaches and Drones - Oh My! Integration of UAS Technology into the National Estuarine Research Reserve System

Susan Bickford, Wells National Estuarine Research Reserve

Interested in bringing Unmanned Aerial Systems into 29 Reserves around the country
Focus on UAS projects and lessons learned with this emerging technology

NOAA grant to test 3 sites for this UAS technology, flying aerials and lidar

- Diverse marsh systems across US using NERRS sites
- Comparing manned data and remotely flone data
- Evaluating value of private contracting versus ramping up NERRS own system

Focus is on vegetation mapping because NERRS program looks at habitat classifications over time, as well as elevation data specifically in areas where SLR monitoring is occurring

Site #1 - Jacques Cousteau NERR
Dune and beach-backed dune system - issues with tide coming in and out, and sand blowing over targets for aerial images

Site #2 Grand Bay NERR
Diverse habitat - black needle rush, pine savannah and smooth cordgrass

Site #3 San Francisco Bay NERR
Marsh system and cattle ranch embedded in the marsh system - a unique coastal environment to capture

Considerations and Things to Think About
Start with end in mind - have the question drive the system you need, the sensor you need, the type of data you need

- Video data useful for object ID in marine debris surveys, lobster or derelict crab pots
- Images - plant health, high versus low marsh, etc.
- Topography - elevational differences

Sensors for a lot of things now

- Sensors for air chemistry
- Dna whale identification through whale blows (snot)
- Pollen samples through fly paper flown over a pariers - there's a lot of sensors

Significant pro of UAS is timing, schedule control, fly as much as you want, available for other uses
Cons - site restrictions - the permits required to fly (conidering FAA, NEPA, Land Ownership)
Slides have table of reserves and what jurisdictions and restrictive classes they are in. Class G is unrestricted airspace and is the most favorable; Certificates and permissions to fly take longer than you want & you can get denied; labor and resource intensive, technology obsolescence

Pros of contracting: No cost of ownership, most current tech, professional experience, and collaboration/cost share can bring the cost down
Cons of contracting - cost and time frame. Contracting is also a long process,and responses to an emergency, storm, etc are hard to manage.

Drones as Tools for Coastal Planning Management and Stakeholder Engagement
Jon Budreski, Air Shark

UAV Flight Services Company

- Original focus was high intensity inspections of utilities like telephone lines
- Process involves a lot of planning (tides, crew availability, etc.), flight operations are brief portion, and a lot of focus is on data processing and data delivery
- Noted the importance of working backward - what is it that the customer wants
- Checklist of planning on slides for a closer example

Capabilities and what matters for flight considerations
    Terrain & obstacles, temperature
    Battery life, line of sight for operator, airspace

Data & what can be captured
    Cameras
    Infrared - useful for solar farms and also estuaries,
    LIDAR - looking for LIDAR beta projects for the next two years
Data types
    Geotagged, imagery, point clouds, GIS, CAD

Gridded flights & control points for control

Point Cloud example - help validate & visualize the amount of sand on a beach and the amount lost in a storm

Jenness Beach example UAV comparison vs existing dataset
    Deriving contours for sea wall combined with line work - worked out well, accuracy was within 1/10th of a foot

DEM example
    Landfill concerned with drainage
    Accuracy within 8% of volume in the earth helped with retainment system for landfill

Monitoring Coastal Erosion via Drone
Rick Harbison, Greater Portland Council of Governments
Overview of projects they have used drones on

- Project in collaboration with Maine Geological Survey for a site that had been dredged 5 years prior and to see what was happening in site - wanted to know at extreme low tide
    - Pushing boundaries for a small drone and a large area (took 3 days of site visits)
    - Comparison with drone and google maps and ArcGIS software options - much more clear
- Another project looking at recently cleared new growth forest, working to get wetland approvals and map wetlands to figure out regulations - wanted new aerial image to reflect new changes
    - Elevation points of drone match up well with elevation contours, except with limitation that LIDAR looks at bare earth and drones picked up the trees

Other notes based on experiences:

- Point cloud can also lead to 3d models
- Coastal bluffs and flying from a boat - landings are difficult - focus on Falmouth
- Emphasis that a drone can take a picture wherever