



The Visual Litter Survey,
Tracking Trash in NJ &
Across the Globe

A New Jersey Beach Litter Survey

Using drones to record tidal litter deposits
for machine learning auto-identification



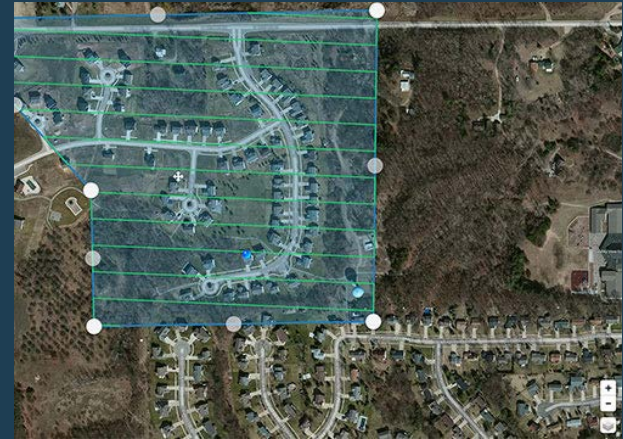
Morris A. Enyeart, Ed.D., DD-Drones.com, Nov. 14, 2017, NJLM Annual Conference



Why use a drone for a visual litter survey?

Immediate Benefits

- Requires less resources, costs less
- Safer in areas where hazards exist or are difficult to access
- Document conditions and inspections
- Provides information to determine resources needed for removal of litter



Why use a drone for a visual litter survey?

Future Benefits

- ❖ Creates a permanent visual record of litter for change-over-time studies
- ❖ Add visual information to reports and websites
- ❖ Creates the data pool for machine-learning programs to do automated recognition and classification of litter



What kind of drone do you need?

- ✓ Drone with an integrated camera to capture JPG, DNG, and video
- ✓ An integrated GPS for location record
- ✓ Controller software with safety and FAA features



Are there US drone makers?

- Unfortunately, there are only three large US commercial grade drone manufacturers and they focus on military and high-end applications such as agriculture and wind tower inspections.
- China produces more than 80% of the world's drones.



Boeing's Insitu
Drone

What about the pilot?

- ❖ If a vendor is used, the pilot should be an FAA Certified Commercial drone pilot with liability insurance.
- ❖ A municipal employee does not have to be an FAA Certified Pilot if the municipality has an FAA Certificate of Authorization (COA).



Certified pilot vs COA

- ❖ To ensure compliance and reduce liability, we recommend municipal, county or State employees hold an FAA Certificate for Commercial drone pilots (Part 107).



US-based Drone Litter Surveys

Island Beach State Park – in progress

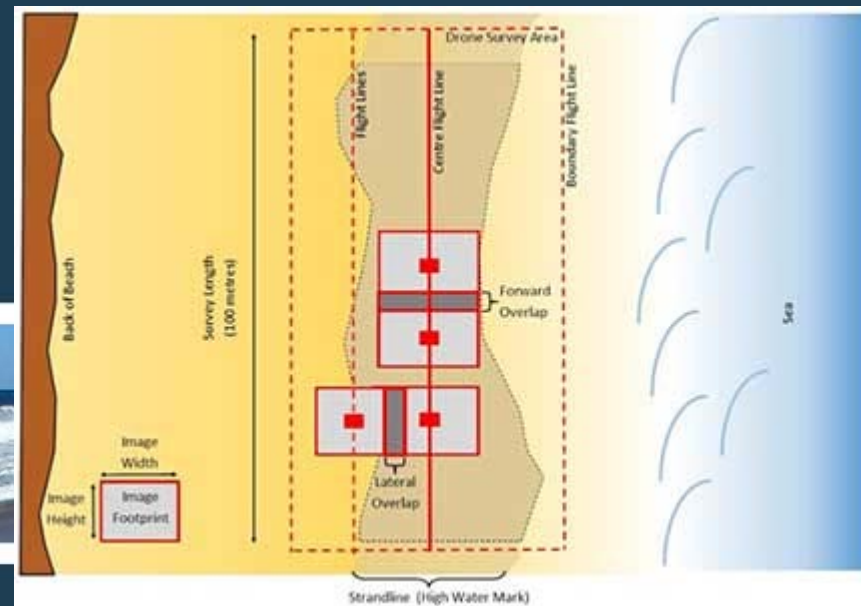
- Mission: Using a drone to photograph and record video tidal litter deposits on 4.8 miles of the IBSP
- DD-Drones approved by the NJ DEP for a Special Use Permit to conduct the drone litter survey
- No other COAs were required for target area



US-based Drone Litter Surveys

Island Beach State Park – in progress

- ~ 100,000 photographs will be taken, 25,000 will be uploaded to cloud open-source database
- Photos used to train a machine-learning algorithm to automatically recognize and classify marine litter



Drone Litter Survey

Benefits

- NJ Clean Communities Council Coordinators can use new methodology for conducting visual litter surveys
- Promotional and Public Awareness photos and video produced for use by NJ Clean Communities Council and NJ Parks
- Process can be adapted to other municipal uses

Piping Plovers
are endangered and
they nest at IBSP



The Next Steps

- ❖ Data and methodology refined and shared with NJ Clean Communities Council for future visual litter surveys.
- ❖ Develop new machine-learning algorithm to “read” 4K video streams to recognize litter objects.
- ❖ Formation of the International Network to share and accelerate the machine learning.



International Drone Litter Surveys



Newly formed international organization joining separate visual litter projects together to share data and knowledge



Your Free Resource

The League of Municipalities maintains a free service for its members who have questions about the following topics.

- Municipal Websites
- General Internet Questions
- Drone resources and uses

