



Visual Litter Surveys

From land-based surveyors to eyes in the sky

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The last statewide visual litter survey (VLS) in New Jersey was conducted by the New Jersey Clean Communities Council in 2004. Based on the results of that survey, NJ Clean Communities created effective litter abatement and educational programs. Fast forward to 2018 and NJ Clean Communities is in the process of coordinating another VLS to further assess the effectiveness of past programs and lay the groundwork for new litter abatement programs to come.

On January 30, more than 100 Clean Communities Coordinators and citizen environmentalists gathered at the Rutgers EcoComplex in Bordentown for a series of presentations and discussions to begin the process for the 2018 VLS, which will be conducted through June this year.

“Photos are uploaded to The Plastic Tide Zooniverse database where they are tagged by someone noting the type of litter in the photo.”

Technology’s new tools

The 2018 VLS will combine a traditional survey team approach with new technology added to assist in data collection and analysis of data. Cellphones and tablets will replace many of the clipboards and sheets of paper used in the past. The use of cellphones in a VLS such as the Bergen County’s pilot app linked to a GIS database shows great promise. Using cellphones to enlist the public in identifying/reporting litter is well-proven by apps such as Litterati and Marine Debris Tracker.

However, even with the new technology applied, a substantial number of surveyors are still needed to conduct a large geographic area VLS. Another new technology currently being used to advance and expand a VLS is the use of drones. Last August, NJ Clean Communities supported the Digital Drifting Special Use permit application to NJDEP Division of Parks and Forestry Service to conduct an eight-month Marine Beach Litter Survey pilot using a drone on Island Beach State Park

(IBSP). The application was approved, and NJ’s first Drone Marine Visual Litter Survey began.

Using a mapping protocol provided by The Plastic Tide, an organization on the forefront of UK marine beach drone litter surveys, the southern 5 miles of IBSP was divided into 100-yard segments. A drone with the camera pointed

straight down at the beach was flown 15 feet above ground level along the mapped area taking two high-resolution photos every second, yielding more than 900 photos.

Photos are uploaded to The Plastic Tide Zooniverse database where they are tagged by someone noting the type of litter in the photo. The purpose of

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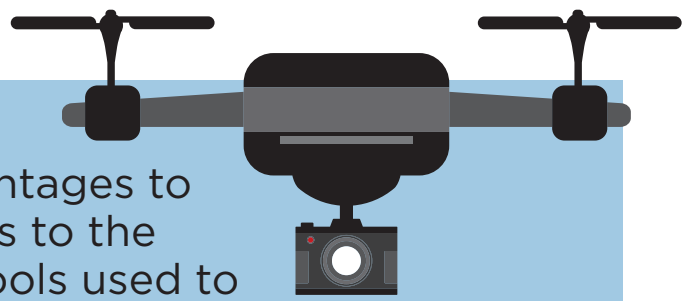
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tagging a photo is to train a machine learning program that is under development to automatically recognize the type of litter, e.g., plastic straw, plastic bottles and caps, fishing line, and other types of plastic litter that wind up on the beach. The ultimate goal of this methodology is to eliminate the need for a person to tag the litter and let the machine do the recognition.

“Change over-time documentation based on drone surveys provide the basis for support and action in existing anti-litter programs.”

Municipal considerations

There are three considerations for municipalities to implement this technology.



High 5!

Primary advantages to adding drones to the technology tools used to conduct a visual litter survey.

1. It takes less resources/people to cover a larger area.
2. Less time is required to do the survey.
3. Experience suggests the camera is capturing litter a person may miss. Pieces of litter partially covered by sand or as small as 1cm are captured in the photo.
4. Surveys can be conducted in hard-to-access and dangerous areas more safely, such as superfund sites, abandoned properties, and steep river banks.
5. Post-survey identification of litter types can be done by anyone from the time and place that is most convenient to them.

In Your Town: What do you need to conduct a visual litter survey with a drone?

1. The drone pilot should be an FAA Certified UAV pilot and/or operating under an FAA Public Entity Certificate of Authorization. Public Entities such as municipalities, states, and counties can obtain a FAA blanket Certificate of Waiver or Authorization to fly a drone that covers a variety of purposes instead of applying for individual COAs.
2. Drone with at 20 MP (or higher) camera on a 3-way gimble, a gyroscope type of camera mount that enables a camera to maintain its position if the drone tilts up, down, or sideways.
3. Drone weight should be at least 2.5 pounds for stability in winds above 5 to 10 mph.
4. Battery allowing for at least 20 minutes of actual flight time.

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• **First**, municipalities can immediately begin to use drone technology to survey properties that may be difficult, dangerous or hard to reach to ensure dumping is not occurring in violation of local ordinances.

• **Second**, they may conduct the drone surveys to document grant applications or enhance their Clean Communities programs.

• **Third**, change over-time documentation based on drone surveys provide the basis for support and action in existing anti-litter programs. As DRONET's visual survey methodology achieves its goals, even greater efficiencies will be realized by municipalities in both marine and non-marine applications.



What's next for VLS?

DRONET leads the way for drone surveys. Discussions with Peter Kohler (Founder and Director of The Plastic Tide in the UK) regarding work in New Zealand and Australia have led to the founding of an international network of marine drone organizations for the purpose of developing the first standard methodology used in conducting Drone Marine Visual Surveys.

The Marine Litter DRONET, a new international organization founded to develop open source protocols and tools for marine surveys conducted using drones (dd-drones.com), has set its sights on two primary, related goals:

First, to develop a standardized protocol for flying the drone (height, speed, area covered, litter categories, and photography settings).

Second, to develop a new, open-source machine learning algorithm to eliminate manual tagging and automatically recognize litter in the photos. DRONET's standardized protocol is nearing completion. The machine learning algorithm development is well under way and expected to reach 80 to 85% recognition within 18 months.

All of DRONET's methodologies and services are being developed as open source products and will be available for any organization or person to use without charge. 📌

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