


Visual Litter Surveys



Where we came from
where we are now
and a new approach to
Visual Litter Surveys

Morris A. Enyeart, Ed.D.
Digital Drifting LLC
January 30, 2018

Traditions Are Changing

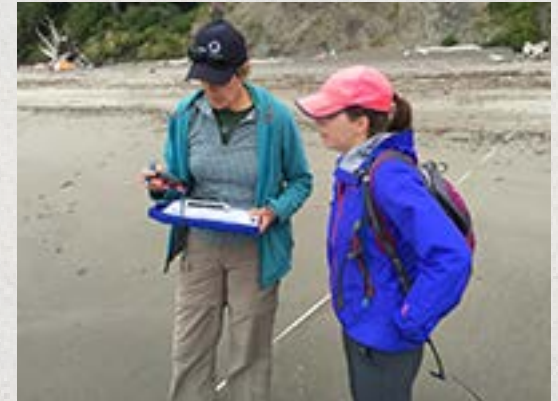
- Visual Litter Survey – walking the walk



Manually Counting & Classifying

- What categories to use?

- plastics
- fisheries related equipment,
- smoking related (cigarette butts, lighters)
- metal (e.g. drink cans, bottle caps, pull tabs)
- glass (e.g. buoys, light globes, fluorescent globes, bottles, etc)
- processed timber



- [UNEP/IOC Guidelines on Survey and Monitoring of Marine Litter](#)
- [Guideline for Monitoring Marine Litter on the Beaches in the OSPAR Maritime Area](#)

Resources & Constraints

- **Government**
 - *New Jersey Clean Communities* statewide litter abatement
Excellent in coordination of multiple entities and involving the public in litter reporting and cleanups.
 - Funding limitations
- **Vendors**
 - provide knowledge and experience
 - typically larger geographic areas
 - higher cost, trained staff
 - better consistency across survey areas
 - more detailed and diverse reporting
- **Volunteers**
 - 1 group per geographic area
 - lower cost
 - consistency may vary
 - less detailed and diverse reports

The background of the slide is a photograph of a beach. On the left side, there is a vertical strip showing a person's legs in blue shorts and sandals walking on the sand. The rest of the background is a close-up of various pieces of litter, including a clear plastic bottle, a yellow plastic straw, a pink plastic straw, and a white plastic straw, all scattered on the sand.

Visual Litter Surveys Where are we now?

Electronic Eyes for the masses

The use of consumer technology goes mainstream as it encourages and enlists the person on the street to participate in visual litter surveys.

A mixture of traditional methods and applying cell phones and tablets for wider data collection.



Visual Litter Surveys

Technology enters the picture

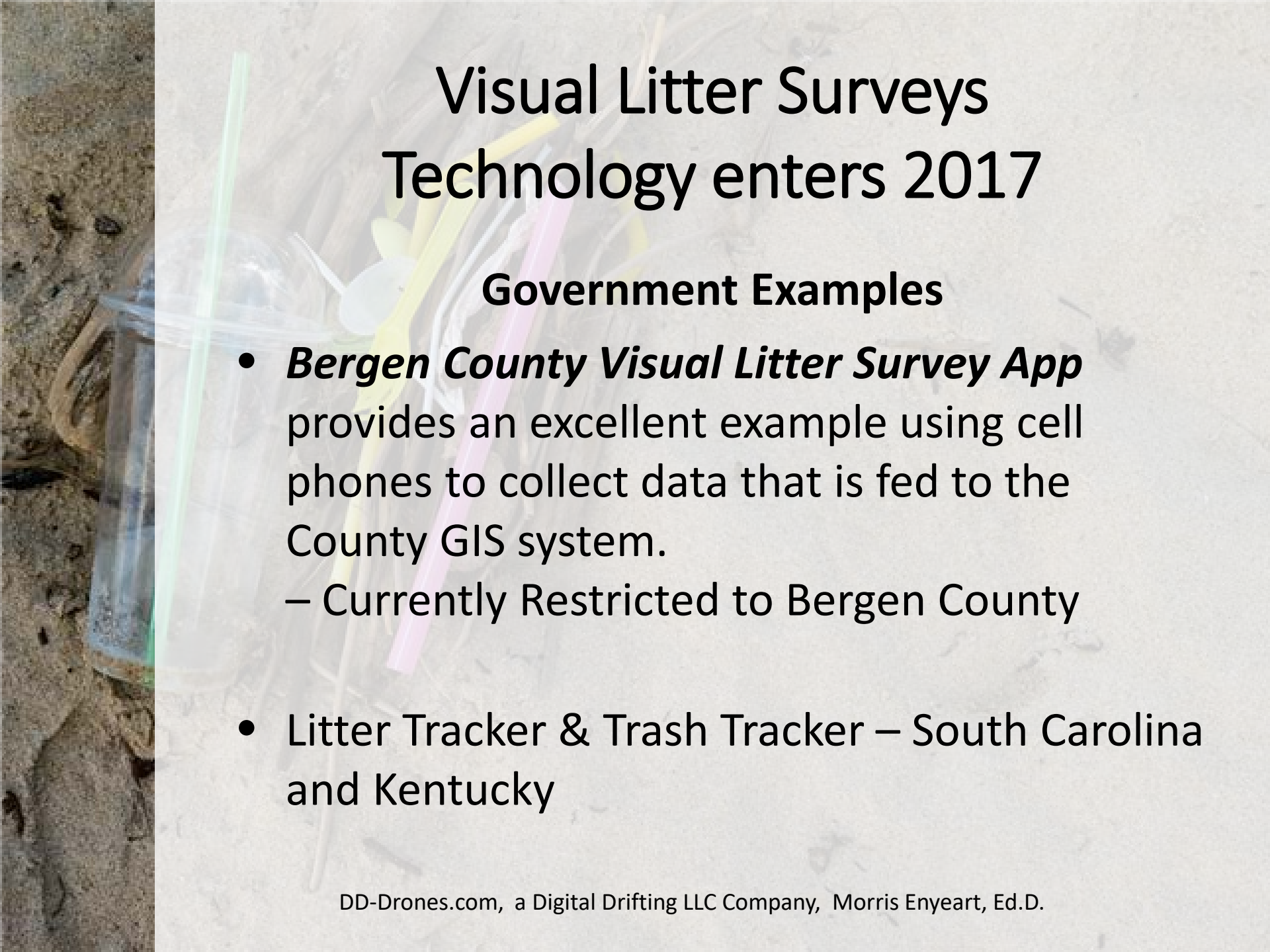
University Electronic Eyes for the masses

- [Marine Debris Tracker](#) – Cell phone App
“With Marine Debris Tracker, it just takes a few seconds to easily report where you find marine debris or litter anywhere in the world... and then prevent it from impacting our oceans.”
- One of the oldest (2010) to employ cell phones and the masses for data collection. Encourages partnerships with various marine litter organizations.

Visual Litter Surveys Technology 2013

All types of litter

- Litterati.org – Worldwide Report & Dispose –
Use your cell phone to take litter photos that are uploaded to Litterati.org (1 million + so far) and then pick and dispose of the litter.
- Excellent App and service, but the revenue model currently depends on grants.



Visual Litter Surveys Technology enters 2017

Government Examples

- ***Bergen County Visual Litter Survey App*** provides an excellent example using cell phones to collect data that is fed to the County GIS system.
 - Currently Restricted to Bergen County
- Litter Tracker & Trash Tracker – South Carolina and Kentucky



Visual Litter Surveys

Electronic Eyes for the masses

What are the current challenges?



Visual Litter Surveys

Current Challenges

Electronic Eyes for the masses

- Applications are proliferating with little or no coordination or standardization.
- The result is towering of data due to lack of standardization and backend processes.
- Efforts are inhibited by revenue models and competition for the same resources to assist with data collection and tagging.



The New Frontier of Litter Surveys

EYES IN THE SKY

EYES IN THE SKY

Utilizes Aerial Photography



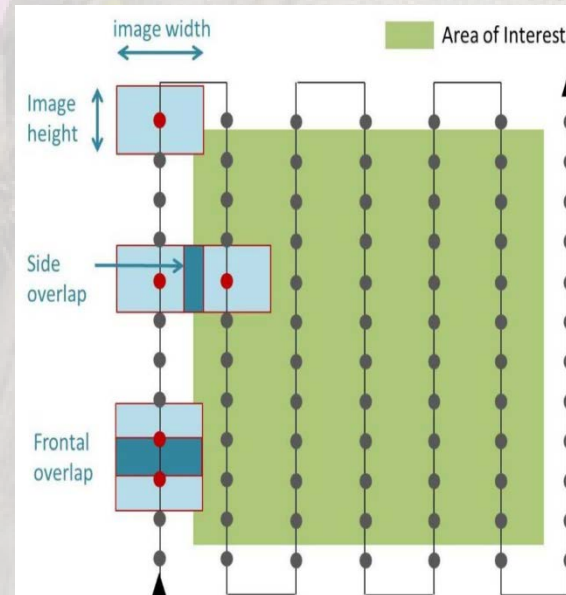
Drone Beach Litter Survey Island Beach State Park, NJ,
Covering 5 miles in 100 yard segments
records ~ 900 – 1,000 photos per segment

Digital Drifting LLC with the support of NJ Clean Communities and Special Use Permit from the New Jersey DEP, Division of Parks & Forestry State Park Service.

DD-Drones.com, a Digital Drifting LLC Company, Morris Enyeart, Ed.D.

EYES IN THE SKY

Standardization of Drone Litter Surveys.



Flight Map – 100 yards long – parallel flight lines 12 foot apart
with 6 foot overlap per line
2 high resolution photos/second

*Courtesy “The Plastic Tide” as they lead the push for standardization of
Marine litter drone surveys*

DD-Drones.com, a Digital Drifting LLC Company, Morris Enyeart, Ed.D.

EYES IN THE SKY

Utilizes Aerial Photography



Recording litter as small as 1 – 3 cm

Drone Beach Litter Survey Island Beach State Park, NJ, Nov. 2017

Digital Drifting LLC with the support of NJ Clean Communities and Special Use Permit from the New Jersey DEP, Division of Parks & Forestry State Park Service.

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EYES IN THE SKY

Questions Abound!!!

- What are the advantages?
- Does it take a lot of training?
- Do I need a special drone?
- Is this ready for use now?
- What does the future hold?

EYES IN THE SKY

What are the advantages?

- It takes less resources/people to cover a larger area.
- It takes less time to do the survey.
- The photography will record items people may miss.
- Surveys can be done in hard to access and dangerous areas more safely.
- It does not take a lot of training.
- Post survey identification and classification can be done by anyone including volunteers.

EYES IN THE SKY

What type of drone should I use?


The most important features

- Camera - 20 MP - 4K HD Video
- Weight – at least 2.5 pounds heavier is more stable in wind
- Battery – 25-30 minutes

EYES IN THE SKY

So, what happens to the
photos?

EYES IN THE SKY



What type of plastic or litter is this?
Please choose an option that best describes what you've found. For definitions see Help

- Plastic fragments ('hard' pieces & 'soft' bags/wrappers)
- Ropes, string, fishing gear (lines, nets)
- Plastic drink bottles
- All other types of bottles & containers
- All other plastic or litter items
- Uncertain (probably litter but not certain)

OK

In Phase 1
Photos are
uploaded to
the cloud
and tagged

“The Plastic Tide”
zooinverse)

EYES IN THE SKY

Tagging is needed to identify the type of litter to create data for reports and train the machine.

It can be done by anyone at the time and location of their own choosing.

A photograph of a beach with litter. In the foreground, there is a clear plastic cup with a green straw. To its right, there are several colorful straws (yellow, pink, white) and a small crab. The background shows sand and some dried twigs.

The New Frontier of Litter Surveys

Where are we headed?



Welcome to Marine Litter Dronet

A new International organization formed to bring together organizations currently using drones for litter surveys as well as scientists working on the machine learning component.

Phase 1 - 2017-2018

Marine Litter Dronet

Official Launch over the next few months.
(11 countries and counting)



Phase 1 - 2017 -2019

The goal of DRONET is to create a **global, standardized, open source** product/process that can be used by anyone without charge to conduct automated Drone Surveys.

The Near Future: 2017-2019

We are working to eliminate manual tagging and instead use



Machine Learning to recognize the litter objects in the photos

Phase 2 - by Digital Drifting The Intermediate Future 2 - 5 years

Use video (4K or higher video) for
the litter survey



and use Machine
and Deep Learning
to extract and
categorize the
litter objects in the
survey video



The New Frontier of Litter Surveys

Morris A. Enyeart, Ed.D.

Digital Drifting LLC

5 Ebbitide Court, Barnegat, NJ 08005

morris@dd-drones.com

+1 609 994-3300