Remote Monitoring of Conservation Easement Properties

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How to Ensure that Protected Land Stays Protected?

About Us

- Established by MD Legislature in 1967
- Maryland's statewide land trust and a unit of the Department of Natural Resources
- Holds over 1,120 conservation easements
- Cares for nearly 140,000 acres
- More than half of MET's easements are coheld with local partners

Stewardship

The "care and feeding" of properties <u>and</u> their owners

Monitoring

The periodic visual assessment of land use

Partnerships

MET relies on its 35 co-holders to monitor, steward, and ensure compliance with easement terms

Monitoring: Visual Assessment of Land Uses

Ground

Drive to and walk/drive around a property, take photos at strategic locations, e.g. streams, struct-ures, accesses

Windshield

From vehicle, or adjacent to roadway, take photographs of landscape visible from road frontage

Fly overs

As passenger in fixed wing aircraft, fly to and circle properties and take photographs

GIS Imagery

Review digital imagery from public sources or from private aerial or satellite firms. Viewed in GIS or online site such as Lens
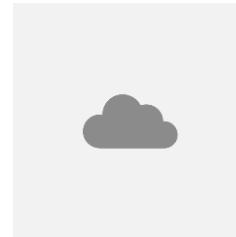
Drone

Onsite, launch a camera-equipped drone to see portions of property difficult to access, or ob-scured by crops or natural vegetation
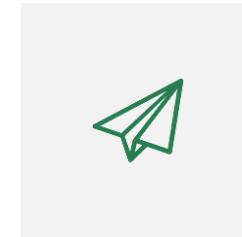
Aerial Monitoring

Recent trials not MET's first use of remote monitoring... But timely access to consistently acquired high resolution imagery has historically been problematic.

Civil Air Patrol

Imagery: oblique, from handheld camera, in hands of passenger, captured while circling at ~1,000 feet,

LightHawk

Imagery: similar to Civil Air Patrol e.g. in 2020 used a Go Pro camera attached to strut of plane, at ~1,000 feet

Hi Res Aerial

Imagery: 6 inch to 1 meter orthographic imagery taken during leaf off or growing season, viewed in GIS

# Current National (LTA) Standard for Monitoring Frequency

- Annual (or more frequent) visual assessment and report

- Review of imagery ideally within same calendar year as flight (more difficult w/MD 6 inch)

- Allows 4 years in 5 to be Remotely Assessed (!)

- *MET's challenges:* to observe 1300 easement properties, more than # of easements, as allowed subdivisions have sometimes yielded upwards of 5 landowners per easement

- Aging portfolio – transfers within and outside donor family

Most CEs in Balt Co, Biggest acreage (and avg area) on Eastern Shore
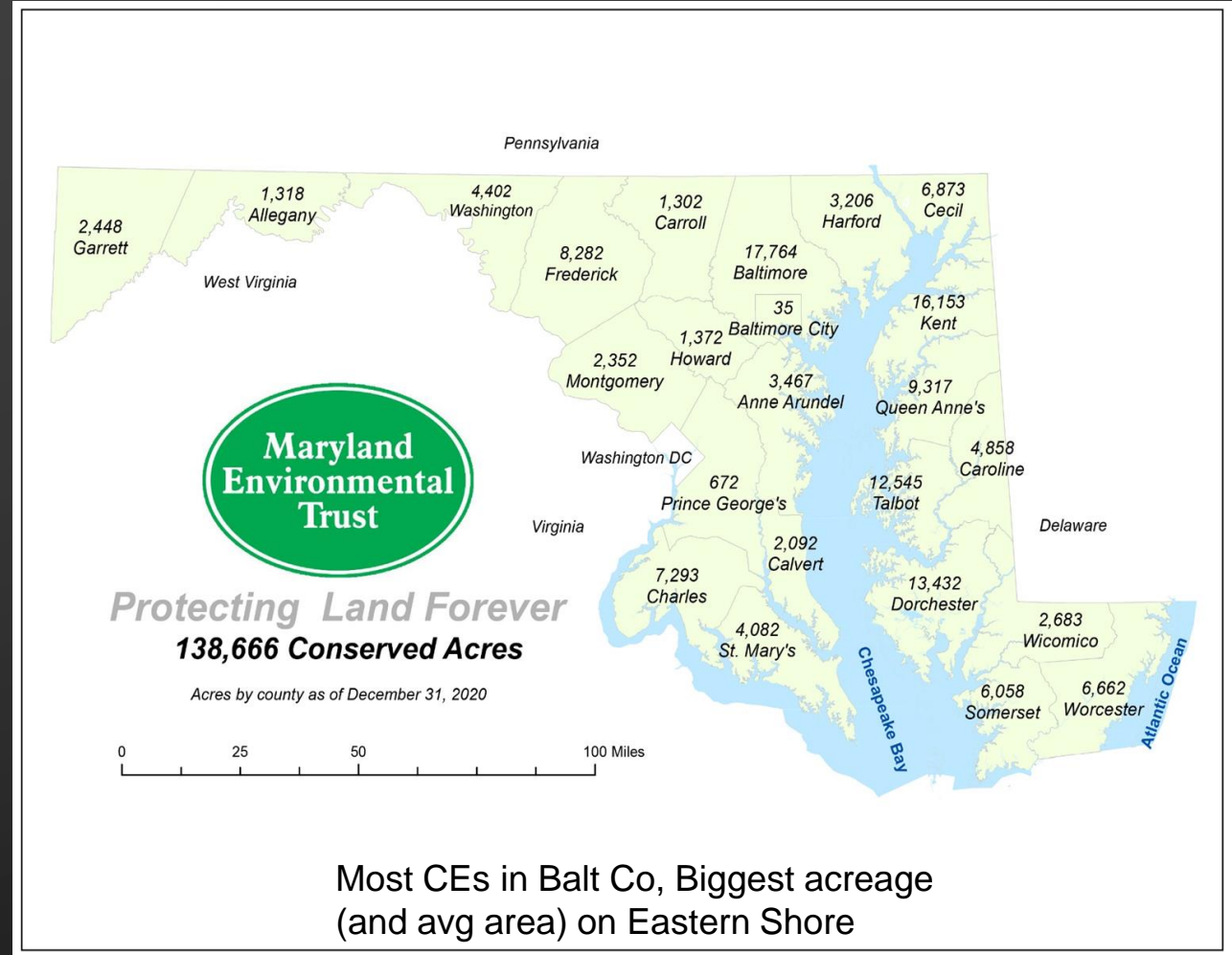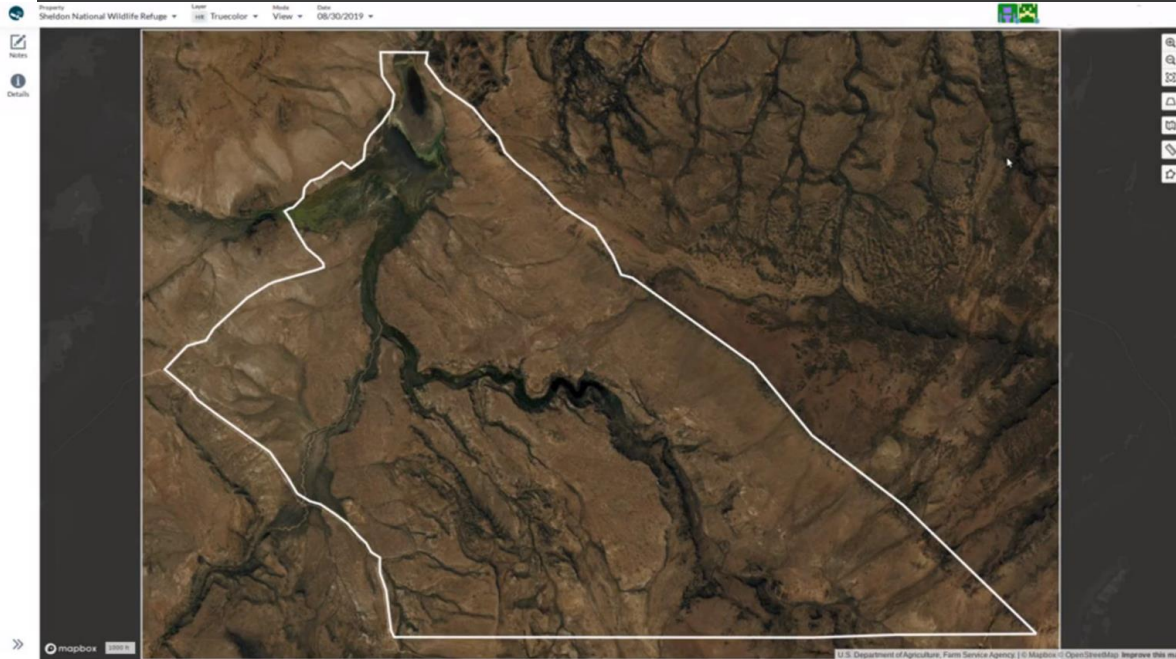
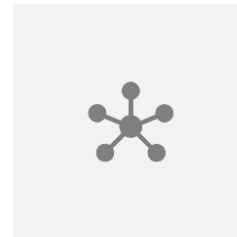# Newest Tool, from
Upstream Tech
Lens for Monitoring
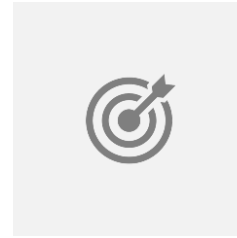
Hi Res Imagery

Access to hi res commercial satellite and public imagery

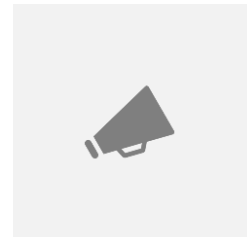## Multi-User

Upwards of 15 users per organization, access thru internet

Features

Allows side-by-side comparison of two dates of imagery, with choice of dates, resolutions

Reporting

Pin areas of concern, type notes and generate a report

Maryland Environmental Trust

Other Features of Lens include:

- Quick access to entire landscape, multiple dates, and imagery types

- Analysis tools using more frequent, lower res, index layers e.g. Vegetation Vigor (IR/NDVI), Water availability

- Zoom, measure tools, pins or polygons for areas of interest

- Ability to supplement OTG with remote, or alternate between methods, depending on size of portfolio, selected frequency, and other available resources

Lens Standard Plan:

- User administrator uploads GIS shapefile of properties

- Ready access to NAIP and lo res (10m-30m) satellite imagery

- May purchase licenses to access recent medium to hi res (1.5m-0.3m) commercial satellite imagery (Maxar, SPOT, AirBus, NearMap)

- Imagery is clipped to property bounds plus buffer (especially helpful with encroachments)

Fall 2020
Eastern Shore pilot with Upstream Tech's Lens© system

MET's Custom Set-up for
Lens© Eastern Shore Pilot (Fall 2020)

- Upload 2019 State of MD 6 inch orthos

- Upload custom GIS feature layers i.e.
  - National Hydrography Dataset Flow lines (streams; higher precision than MD sources)
  - Building footprints – to clue in on locations of past development

- Purchase, as needed, hi res commercial satellite imagery (6 cents/ac), when
  - Hi res aerial imagery was unavailable, or
  - more than 1 year old when viewed

- Used the 2019 MD 6 inch imagery in pilot project to check purchased 2020 hi res (30 or 50 cm) satellite imagery, and 1.5 m satellite imagery when hi res not available

2021
Custom Setup for MET Western Shore Pilot

- Acquired Spring 2020 6 inch imagery from DoIT in custom download in Feb 2021

- Used as primary source until April 15, after which was only able to use as   check to purchased imagery

- Focused on largest properties first to minimize purchases @ 6 cents/ac

- Then solely held and properties co-held with low frequency-reporting partners >25 ac in size

Results

Eastern Shore Pilot 2020

- 140 Properties
- 19,000 acres assessed

Western Shore Pilot 2021

- 430 properties
- 47,000 acres assessed

RFB Plantings

Riparian forest buffer planting opportunities identified and letter sent to landowners with suboptimal riparian buffers

Benefits

- Saw parts of properties not easily seen OTG due to hydrography, cover, no means of access

- During COVID lockdown, avoided hundreds of hours and 1,000s of miles of travel by volunteers and staff

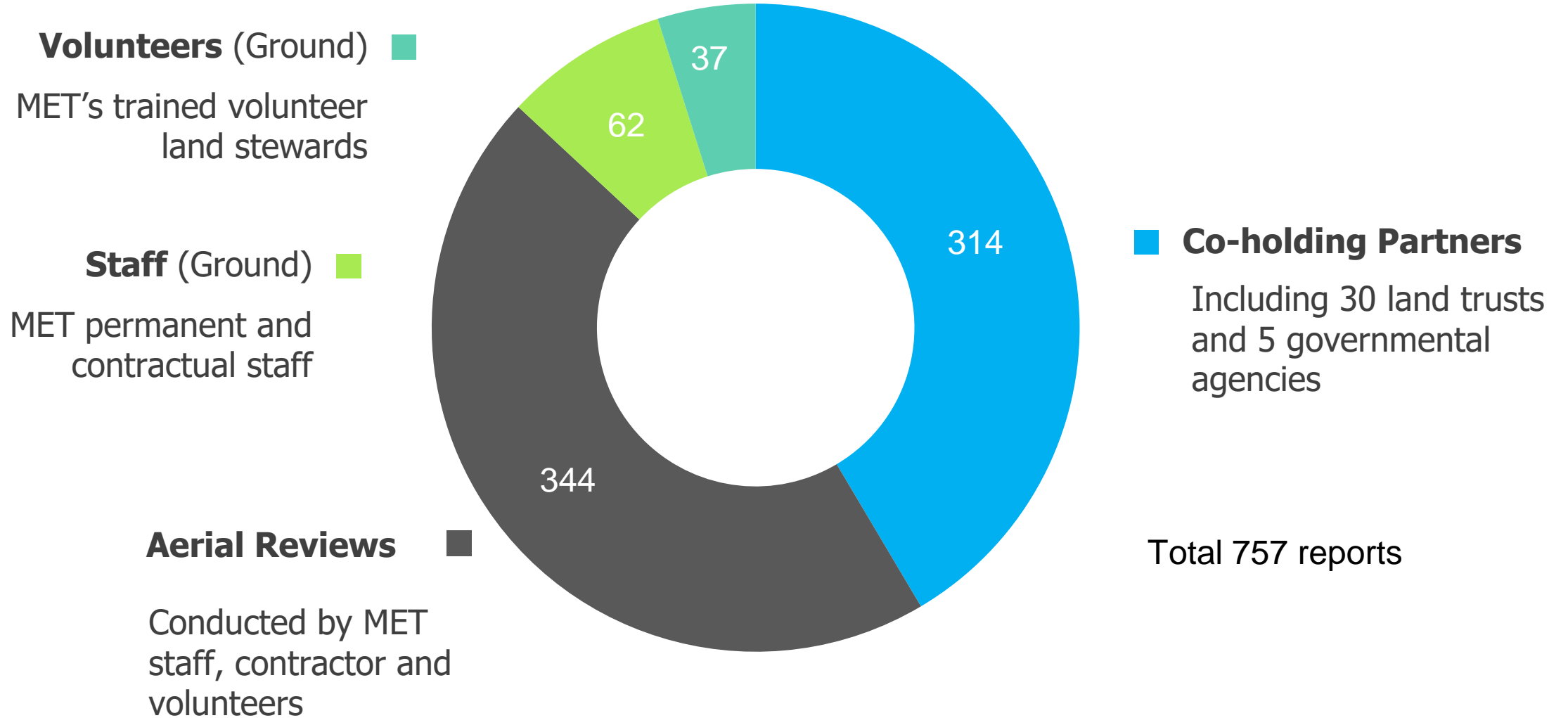- Spawned LTA/TNC Grant Project with Lower Shore Land Trust

Cost Analysis

Costs

- $8,000/year for access, plus customization with feature layers plus processing and storage of MD 6 inch imagery

- $3,400 for "purchased" (licensed) hi res sat imagery (57,000 acres) – [used MD 6 inch ortho imagery for 9,000 ac, while still valid (<1yo)]

- GIS enhancement and setup (~90 hours) plus report review & processing time (adds up with many reports)

Biggest Pros and Cons

- + Minimized danger of viral transmission

- + Avoided gas consumption, CO_2 production, vehicle and driver wear and tear

- + Involved staff, volunteers, LLT partners in groundbreaking pilots of new tech

- - Reduced land trust-to-landowner interaction… in phone calls arranging visits and onsite in touring properties

MET's FY2021 Monitor Reporting

Volunteers (Ground)

MET's trained volunteer land stewards

Staff (Ground)

MET permanent and contractual staff

Aerial Reviews

Conducted by MET staff, contractor and volunteers

37
62
344
314

Co-holding Partners

Including 30 land trusts and 5 governmental agencies

Total 757 reports

Comparison: Lessons Learned Thus Far

On-the-Ground Monitoring

- Normal process using staff and volunteers, and is often enjoyed exercise

- Encourages familiarity with landscape, and when they are present, landowner or other on-site contact(s)

- Allows observer to see below tree cover and areas of interest up close (e.g. beneath pine stand, small piles of refuse or construction materials, use/type of structure, buffer composition, etc.)

- Not limited by timing or resolution of imagery

- Is impacted by precipitation, temperature/humidity, hunting, insects, loose animals, access

Remote Monitoring

- Multiple areas of savings:
  - Time and fuel spent traveling to/from and between properties, and eliminating returns to see areas missed
  - Eliminates need to coordinate visits with landowners or farm managers, and multiple contacts on same day
  - Allows view of all parts of a property (not obscured by tree cover), especially those difficult to access due to terrain, wetness/wetlands or crops

- Recognize that there is less landowner interaction. MET is looking into how to address the relationship piece of the puzzle.

Growth Strategy

How will MET use this technology in the future?

| Phase 1	Phase 2	Phase 3
o November 2020 – February 2021	o March 2021 – February 2022	o **March 2022 and beyond**
o Reviewed Eastern Shore solely held portfolio and imagery	o Western Shore solely held portfolio and those co-held with low frequency reporting cooperators	o Going forward, MET will be examining **what is the optimal frequency of on-the–ground versus remote monitoring?**
o ~140 properties/imagery reviews	o ~430 properties/imagery reviews	o **Factors:**
o 14 reviewers: staff, Board & volunteers	o **Thanks to TNC & LTA grant bringing on LSLT and their purchased easement portfolio**	· **Cost** · **Availability of new State of MD 6 inch ortho +/or NAIP** · **Partner interest**

Blended Monitoring Plan

For MET, the solution to monitoring is a **blend of methods**, including aerial reviews, on-the-ground monitoring and visits conducted by co-holding partners.
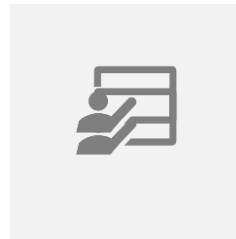
We salute land trust cooperators for all the work you do to help us reach our goals!
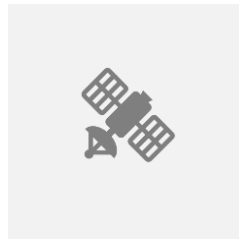
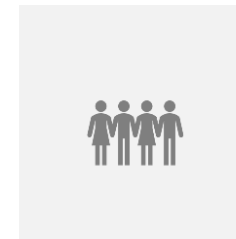| Aerial	Ground	Partners
Perhaps 2/3 (?) of combined Solely Held and low frequency reporting coheld properties per year using Lens	MET volunteers and staff will continue to conduct regular on-the-ground visits (on 1/3 of portfolio?) as well as other routine stewardship visits.	An increasing number of co-holding partners are reporting annually on the more than half of MET's portfolio that is coheld.

Summary

○ MET has successfully used Lens to review imagery and generate monitoring reports for our easement properties.

○ 570 properties (66,000 acres) were reviewed using Lens in 2020 and 2021.

○ In a compilation of reports from the 66 properties where there was both an on-the-ground and a Lens remote monitoring review, the **average savings** of a Lens review over an OTG visit (including driving time) was **2.43 hours or roughly 89%.** Combine that with gas, Carbon footprint, and driver and vehicle wear and tear, these are impressive savings!

○ Going forward, MET will be examining what the optimal frequency of on-the-ground versus remote monitoring will be. Also, how to maintain landowner relationships while using remote monitoring technology.

Thank You

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🌐 https://dnr.maryland.gov/met