

An aerial photograph of Earth's terrain, showing a mix of green, brown, and blue colors representing different land and water features. A semi-transparent globe is overlaid on the image, centered on the Americas. The globe is rendered in a light, textured style, showing the continents and oceans. The overall image has a high-resolution, detailed appearance.

The Role of Earth Observation Data in Decision- Making For Climate Resilient Infrastructure

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AFTER THE FLOOD:

THE IMPACT OF CLIMATE CHANGE ON MENTAL HEALTH AND LOST TIME FROM WORK



FLOOD VICTIM FROM ALEXUS' FLOOD IN BURLINGTON, ON
SOURCE: ROBERT DEKAS

DANA DECENT AND DR. BLAIR FELTMATE | INTACT CENTRE ON CLIMATE ADAPTATION | JUNE 2018

GENEROUSLY SUPPORTED BY:



What are the costs of extreme climate events for communities in Ontario?

Short-term Average Costs

(real 2020 CDN \$)

2030

- Climate Static: **\$11bn/yr**
- Climate Unstable: **+\$1.5bn/yr**

Long-term Average Additional Costs

(without any adaptation measures)

2100

- Medium emissions scenario: **+ \$2.2bn/yr**
- High emissions scenario: **+4.1 bn/yr**

Source: *Costing Climate Change Impacts to Public Transportation Infrastructure* (2022)

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Natural Assets

- Wetlands
- Forests
- Grasslands
- Riparian areas
- Soils, etc.



Green Infrastructure

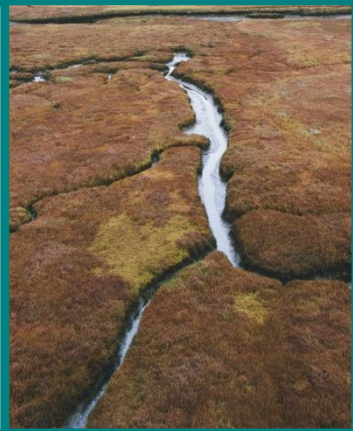
- Natural Assets
- Enhanced Assets
 - urban trees, parks
- Engineered Assets
 - green roofs, etc.

What is "climate resilient infrastructure?"

Ecosystem Services

Wetlands provide:

- Water purification
- Temperature regulation
- Stabilize biodiversity
- Flood control



Nature-based Solutions

- Actions to protect, manage, restore natural or modified ecosystems that address societal challenges
- Provide benefits for the well-being of people & biodiversity.



What value can be gained by investing in green infrastructure solutions?

**\$18.9
MILLION**

Annual provision of stormwater conveyance and drainage from a 7-kilometre riverbank along Oshawa Creek watershed

-valued in terms of replacement costs

**\$3.5-4
MILLION**

Stormwater storage of natural ponds in White Tower Park, Gibsons, B.C.

-valued in terms of replacement costs

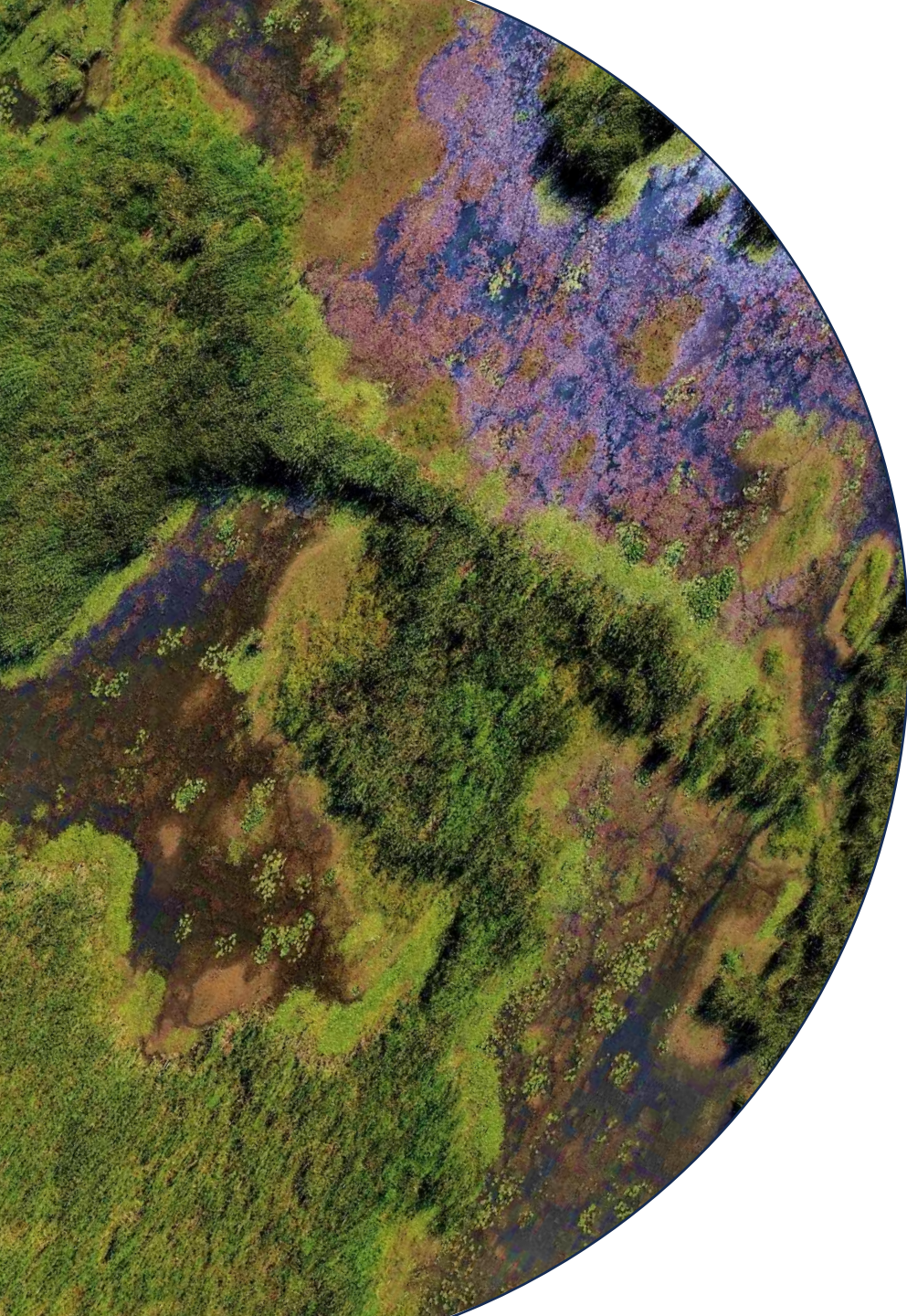
**\$2.4
MILLION**

Flood damage reduction for downstream properties in Courtenay B.C. from widening and naturalizing 1,292 metres of the Courtenay River, riverbank.

Source: *Getting Nature on the Balance Sheet: Recognizing the Financial Value of Natural Assets in a Changing Climate* (2022)

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Why earth observation (e.o.) data?

Data Democracy

E.O data establishes a baseline knowledge for all stakeholders. It is becoming easier for individuals to access, thus increasing transparency and participation from citizen scientists.

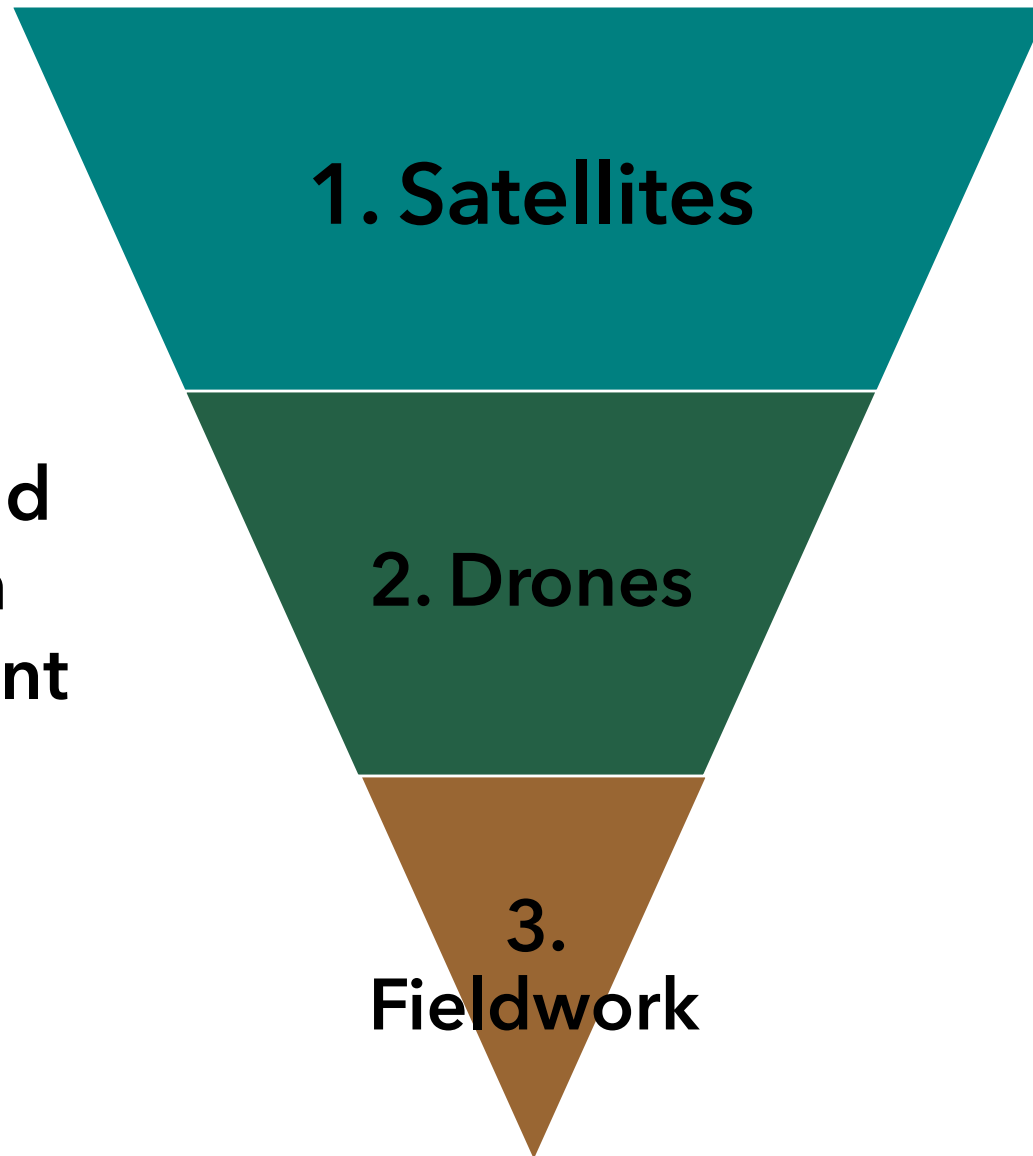
Data in Context

It contributes toward a common picture of a site. It facilitates the ability to identify threats to natural assets and ecosystem service provision.

Data Analytics

Tools and indices provide deeper insight on: vegetation and wetland health, tree canopies, flood risks, etc. Supports land use & investment policy development and decisions.

How can satellite and drone data complement fieldwork?



1.

- Large-scale data over regional areas
- Shows urban context and natural environment over time
 - Reduced control over the timing or frequency of satellite images taken

2.

- High-resolution, geolocated data over a larger area than fieldwork
- Can help identify areas to target for fieldwork
 - Affordable, frequent monitoring

3.

- High-quality, precise data, over a small area
- Ground-truth
 - Time-intensive, requiring more people to cover larger areas

Satellite Image

Urban land trust, rare has mission to secure the 900+ acre green corridor along the Eramosa River.

Water quality is exceptional upstream, declines as it approaches Guelph due to landfill, industry, untreated stormwater.

Rockwood Conservation Area

Municipal boundary

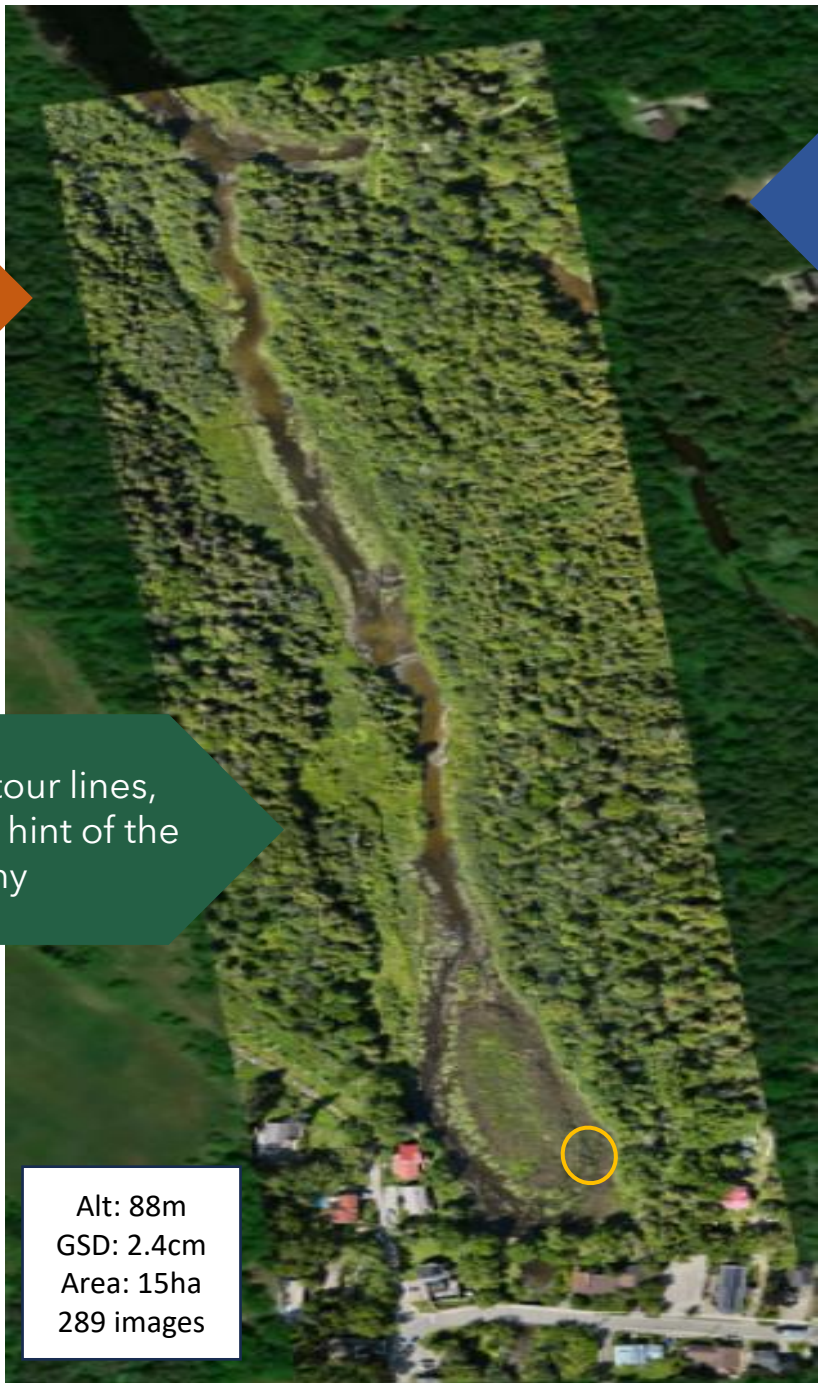
Area of Interest

Automatic water level gauge installed by the Grand River Conservation Authority to monitor flood risk.

Eramosa R.

Guelph

Riparian buffer narrows as it enters urban Guelph



Drones provides visual access to difficult to access areas provide.

Even without contour lines, shading provides a hint of the topography

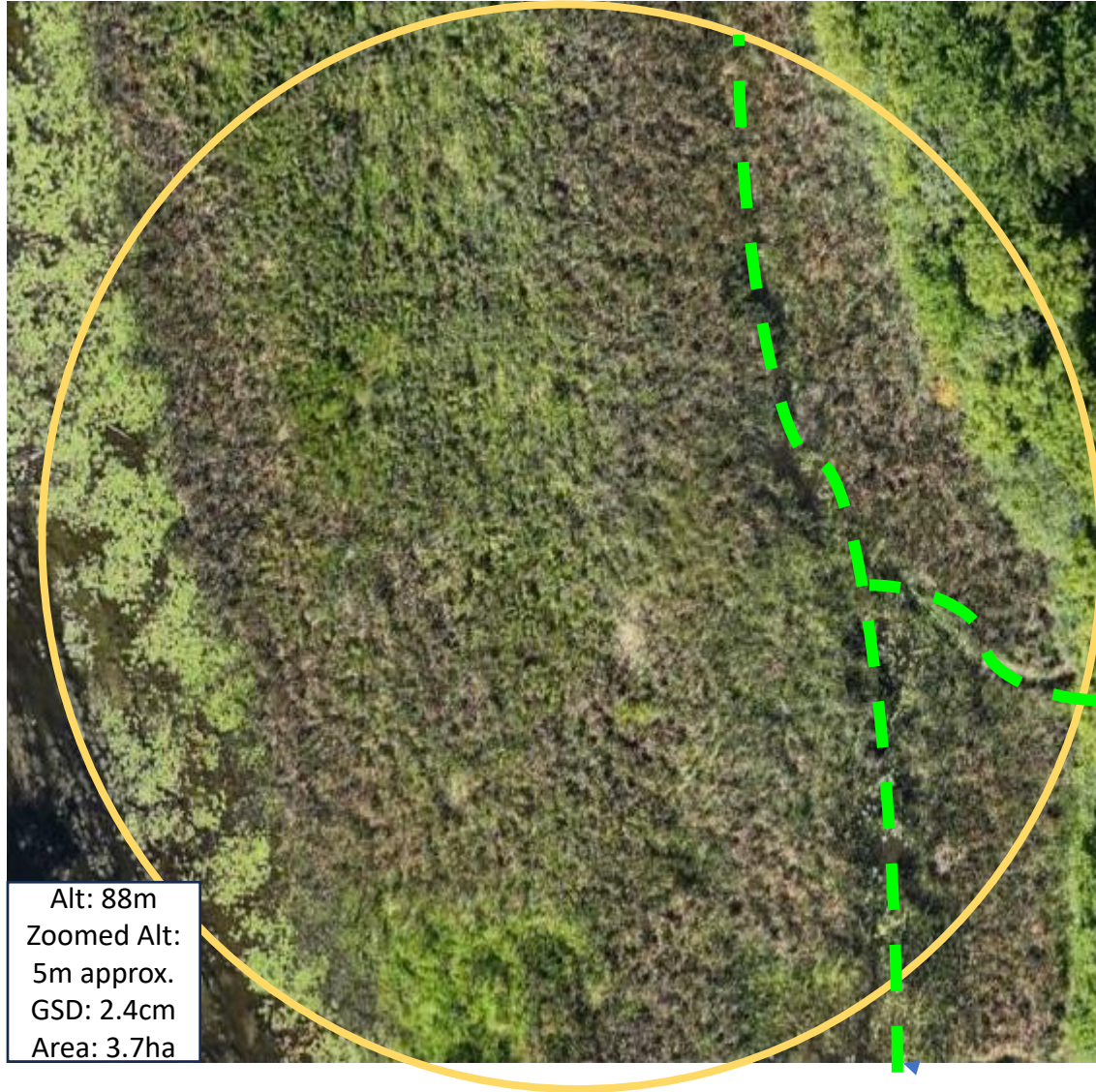
Drone Image

Looks similar to a less blurry satellite image however no issues with cloud cover

Alt: 88m
GSD: 2.4cm
Area: 15ha
289 images

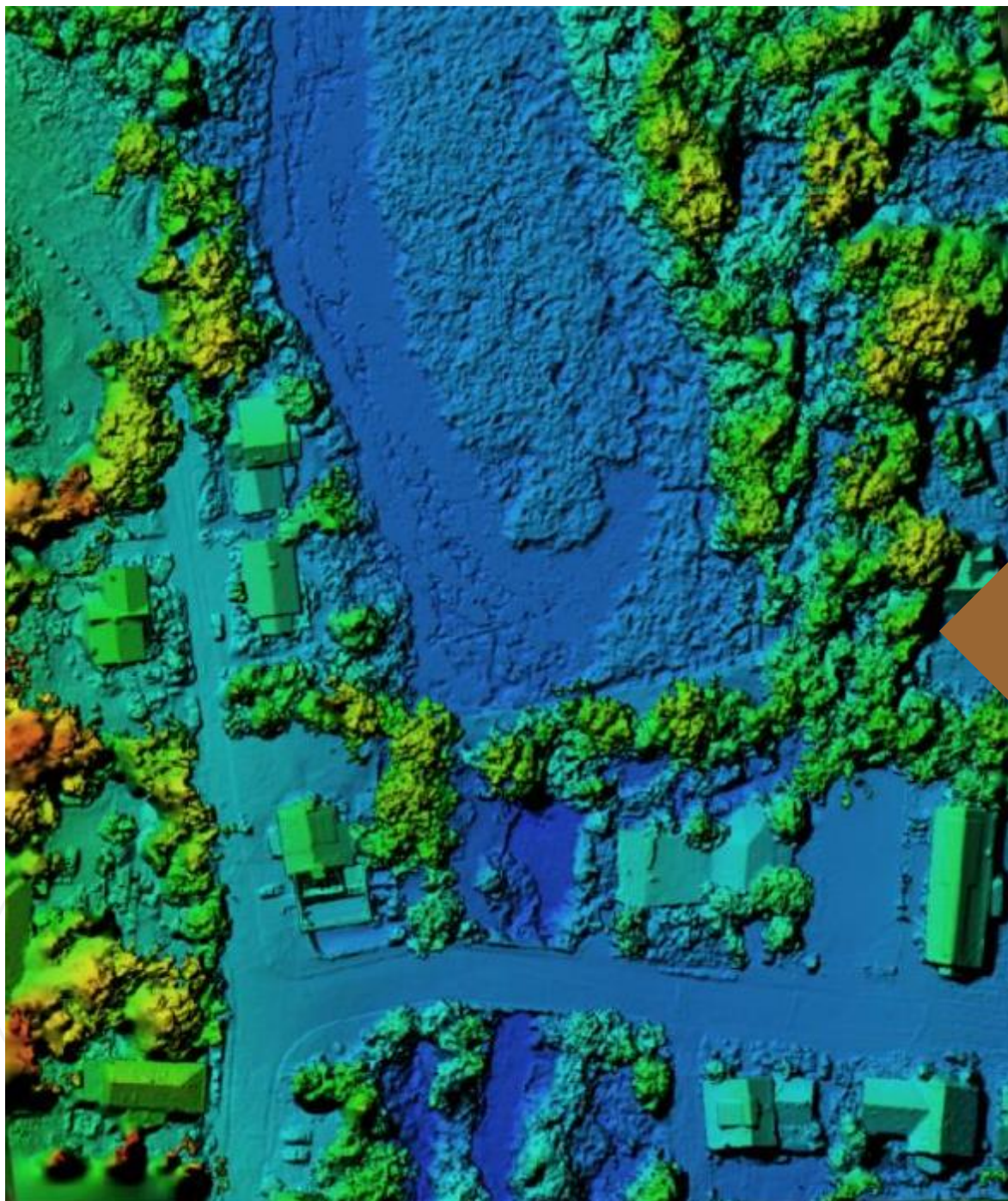
Zoomed-in Drone Image

High resolution images (GSD 2.4cm) makes it possible to focus on invasive aquatic vegetation and see die-off.



Alt: 88m
Zoomed Alt:
5m approx.
GSD: 2.4cm
Area: 3.7ha

Beaver trail



Zoomed-in Elevation Map

This elevation map suggests the surrounding roads and homes are within a floodplain

Elevation



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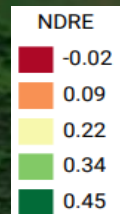
Multispectral Drone Image

Multispectral sensors and various indices make it possible to see detect and respond to plant and water stress.

"Greenness" is an indicator of strong plant health

"Red " water could indicate either turbidity or shallow water. Black water could indicate areas where water is deeper.

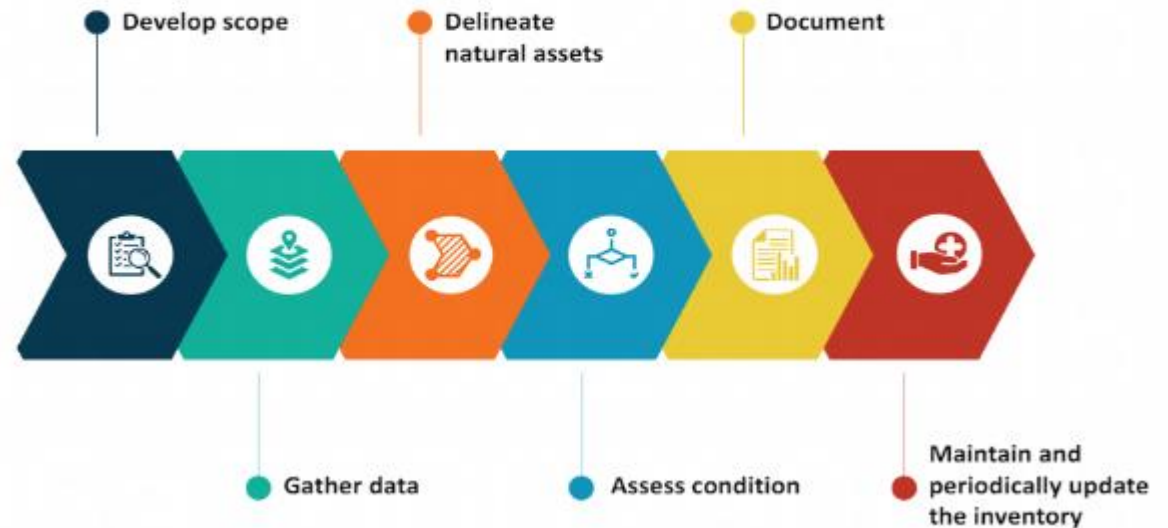
Zooming in shows spots where there is "healthy" plant growth in the river.



Specifications for natural asset inventories

How to get started in
climate-resilient
infrastructure.

Figure 4
Steps involved in development of a natural asset inventory
(See Clause 5.1.)





Thank you!

Grace Saunders-Hogberg, Drone Consultant
Founder, veritas terrae

Contact: 226-343-2591
grace@veritasterrae.ca

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