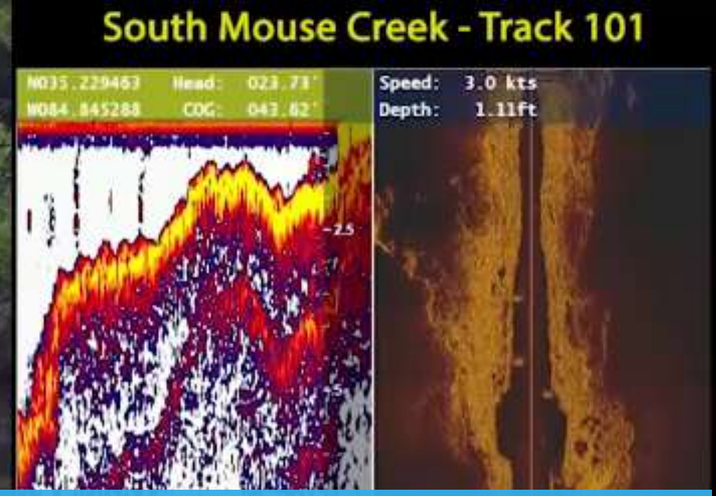


High Definition Stream Survey

A Fast, Affordable, and Flexible Method to Document Stream Corridor Conditions and Support Management Actions

Prepared by James E. Parham, Ph.D.
Trutta Environmental Solutions
SBA 8(a), EDWOSB Certified

TRUTTA ENVIRONMENTAL SOLUTIONS

SBA 8(a) Certified

Stream Restoration

The goal of ecological stream restoration is to restore the stream ecosystem's physical, chemical, and biological composition as close as possible to the native state given the permanent watershed alterations[1]

The five most common goals

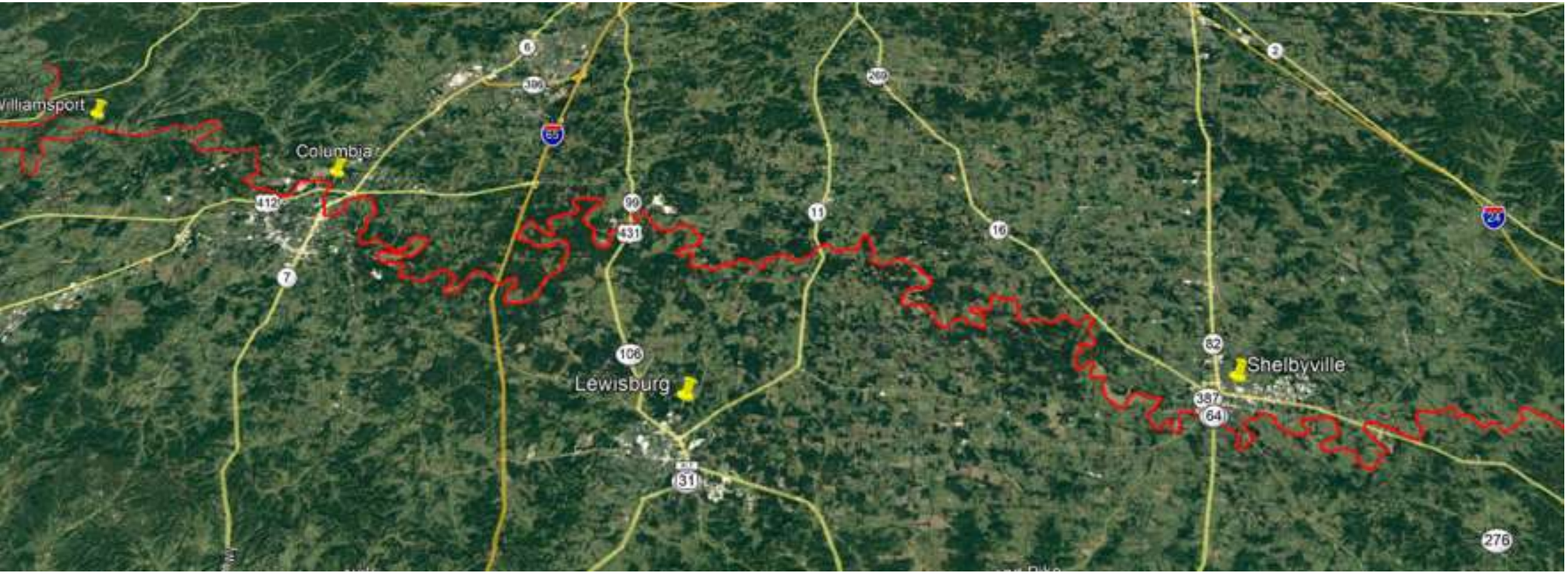
- **improve water quality;**
- **manage riparian zones;**
- **improve in-stream habitat;**
- **allow for fish passage and**
- **stabilize stream banks[2]**

Where? Why? How?

[1] Murdock, 2005; [2] Bernhardt et al. 2008

Fast Inventory and Assessment

Duck River, TN 155 MILES, 250 XS, 2 SURVEYORS, 10 DAYS



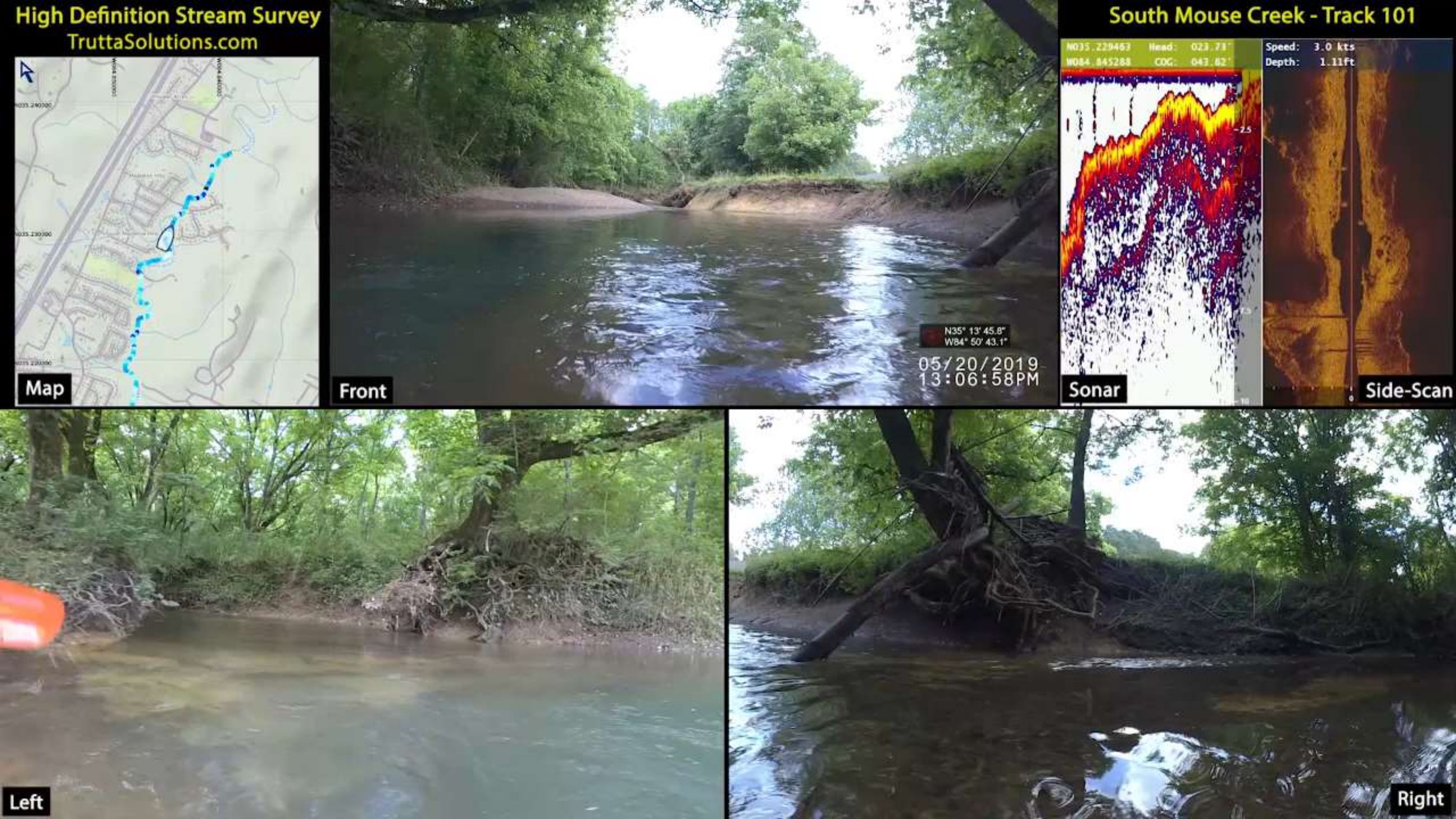
TN Department of Environment & Conservation

CPWS
Columbia Power & Water Systems

DUCK RIVER AGENCY

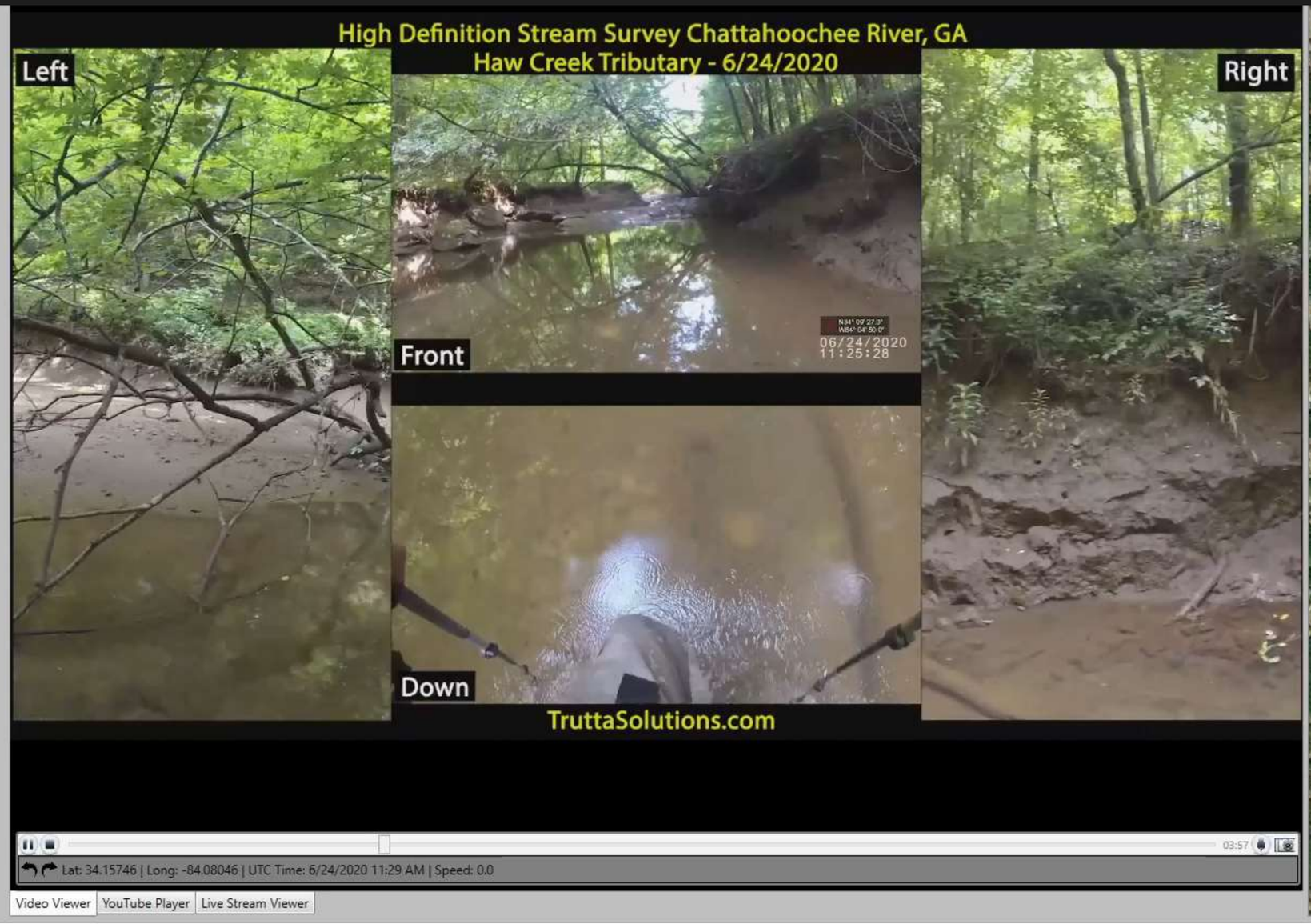
South Central Tennessee Development District

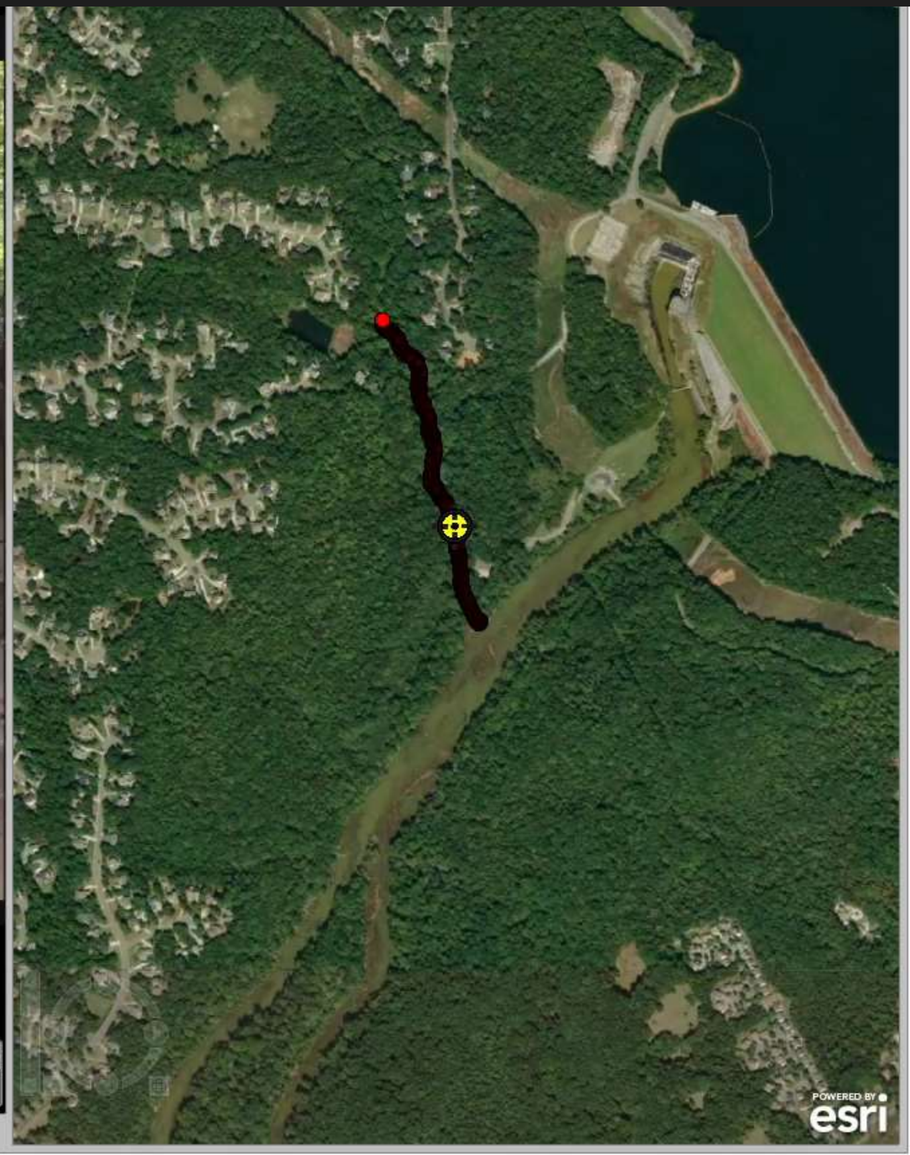
O'BRIEN & GERE


High Definition Stream Survey
TruttaSolutions.com
Map
Front
N35° 13' 45.8"
W84° 50' 43.1"
05/20/2019
13:06:58PM
South Mouse Creek - Track 101
Sonar
Speed: 3.0 kts
Depth: 1.11ft
Side-Scan
Left
Right

spatial metadata embedded in video:

works in arcgis, qgis & remote geosystems geotagger



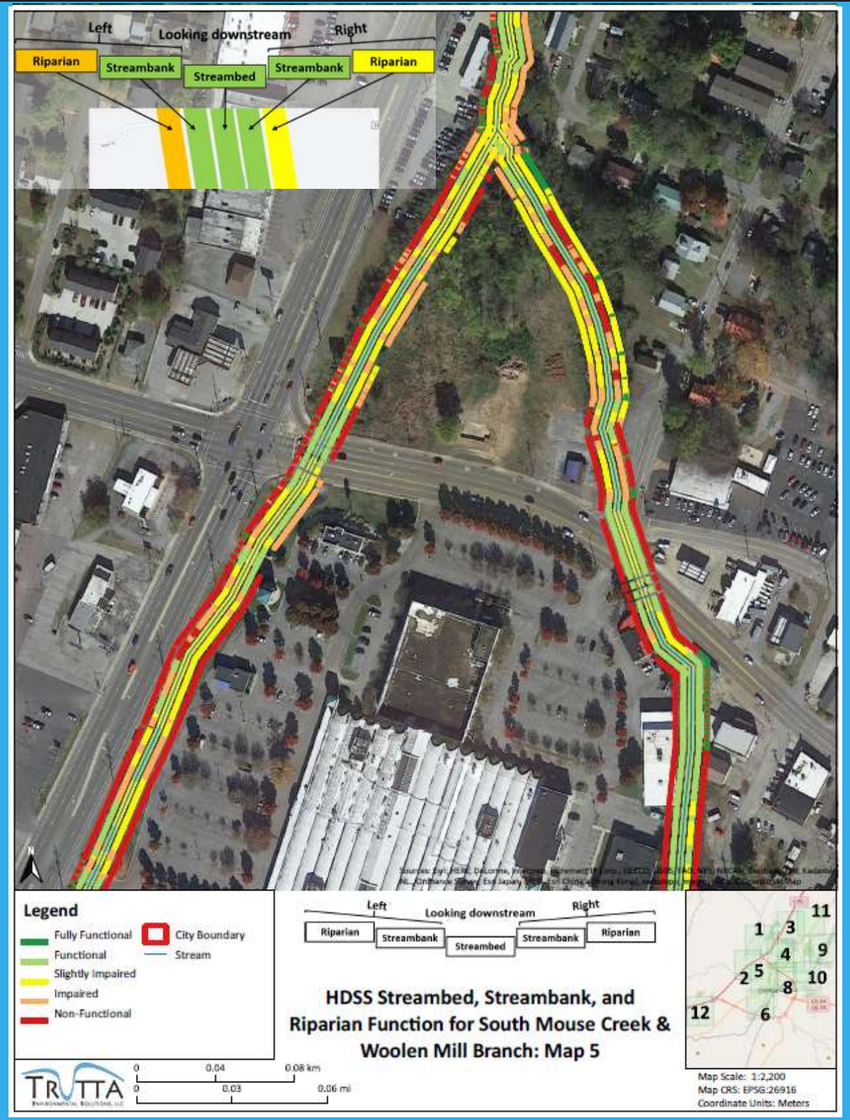


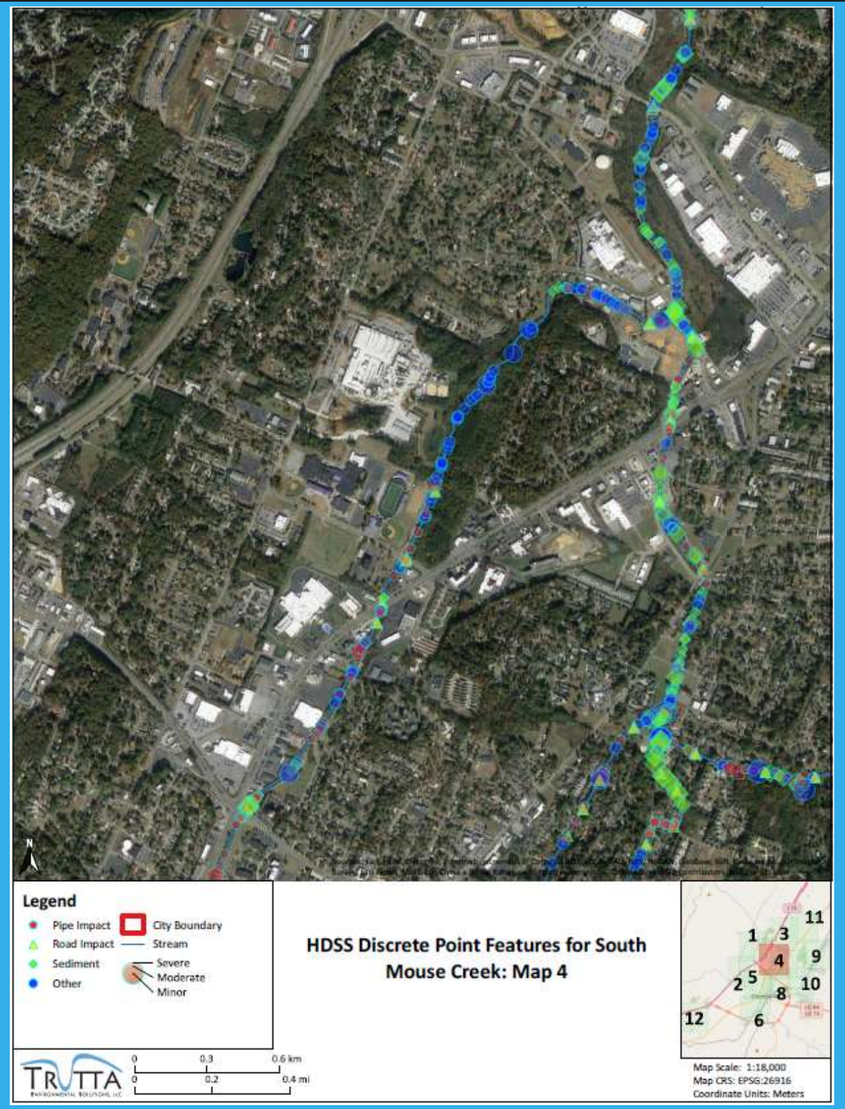
Condition data linked in gis

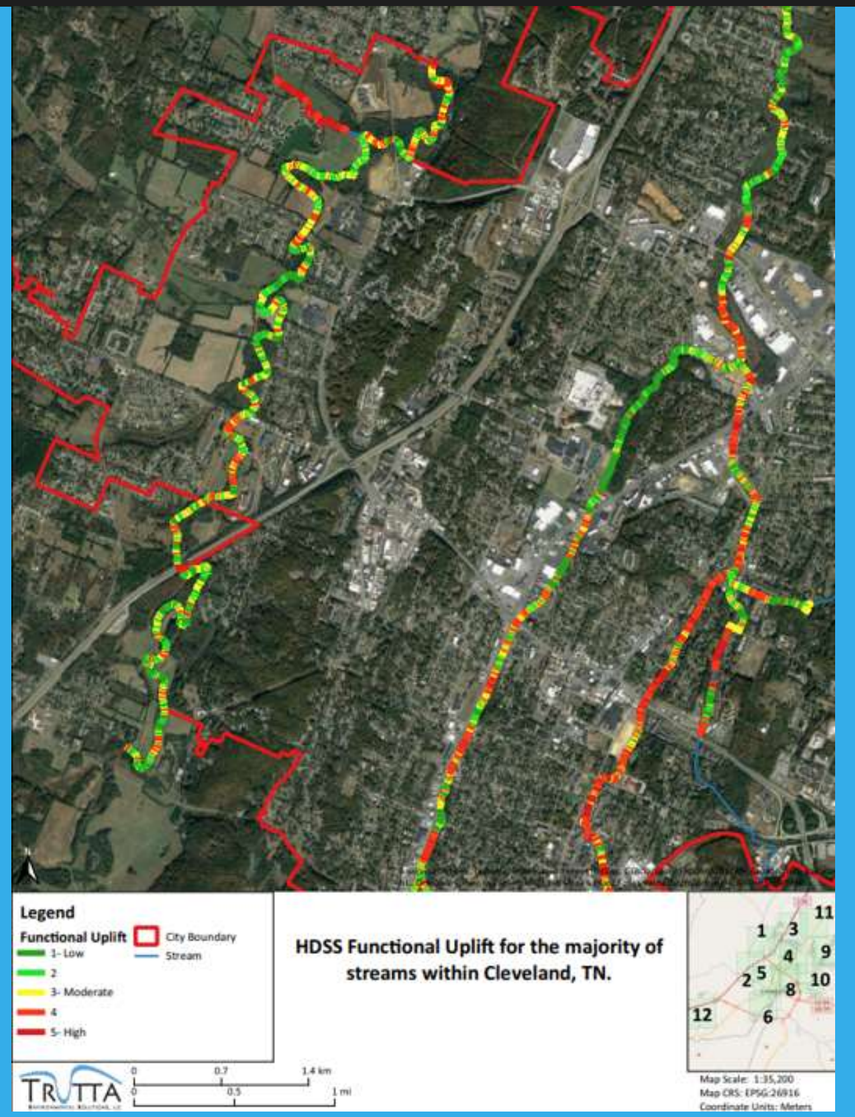
time, location & condition scores

maps showing System condition:

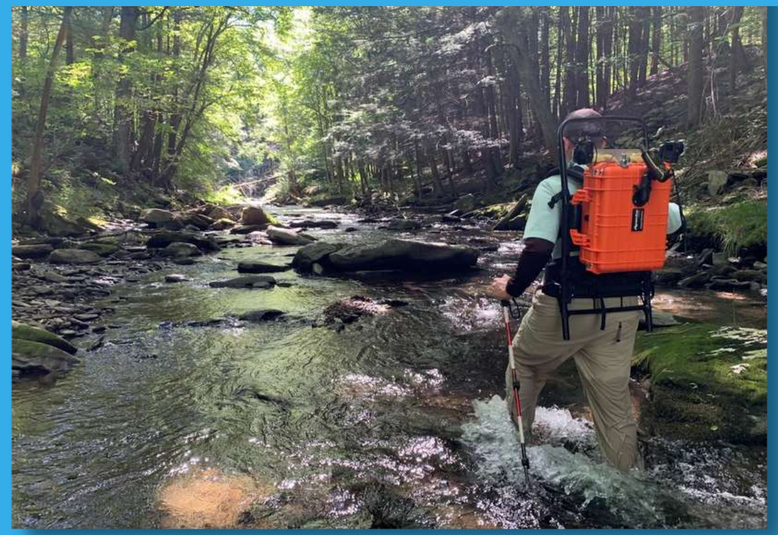
continuous data, point data & prioritized data







how do we collect data?



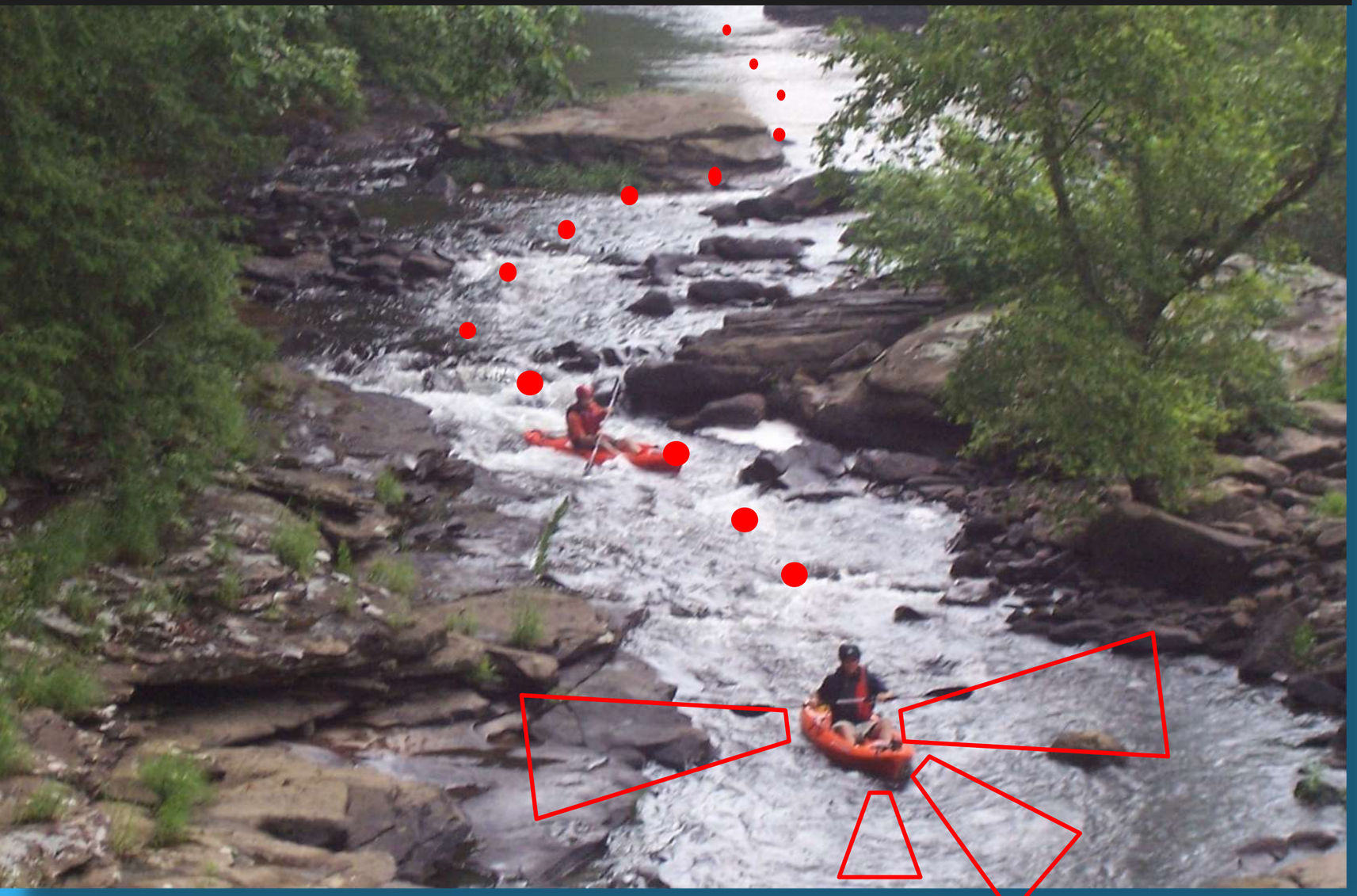
BACKPACK

KAYAK

INFLATABLE BOAT

DRONES: Coming soon

what data do we collect?



Side Video/LiDAR
- Left & Right Streambank
- Riparian
- Floodplain Access
- Infrastructure

Front Video
- Habitat Type
- Canopy Cover

Down Video & Sonar
- Depth
- Side-scan imagery
- Substrate Type
- Embeddedness

Water Quality Sensor
- DO, pH, Temp, etc.

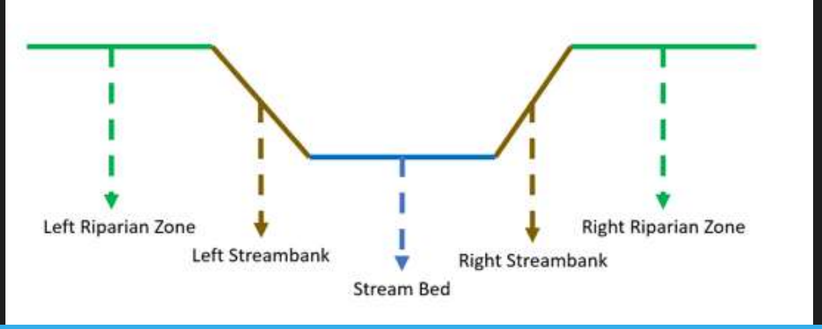
Acoustic Doppler Current Profiler
- Bathymetry
- Discharge
- Transects

Water Grab Samples
- eDNA

GPS

Time
Location
Elevation

streambank condition

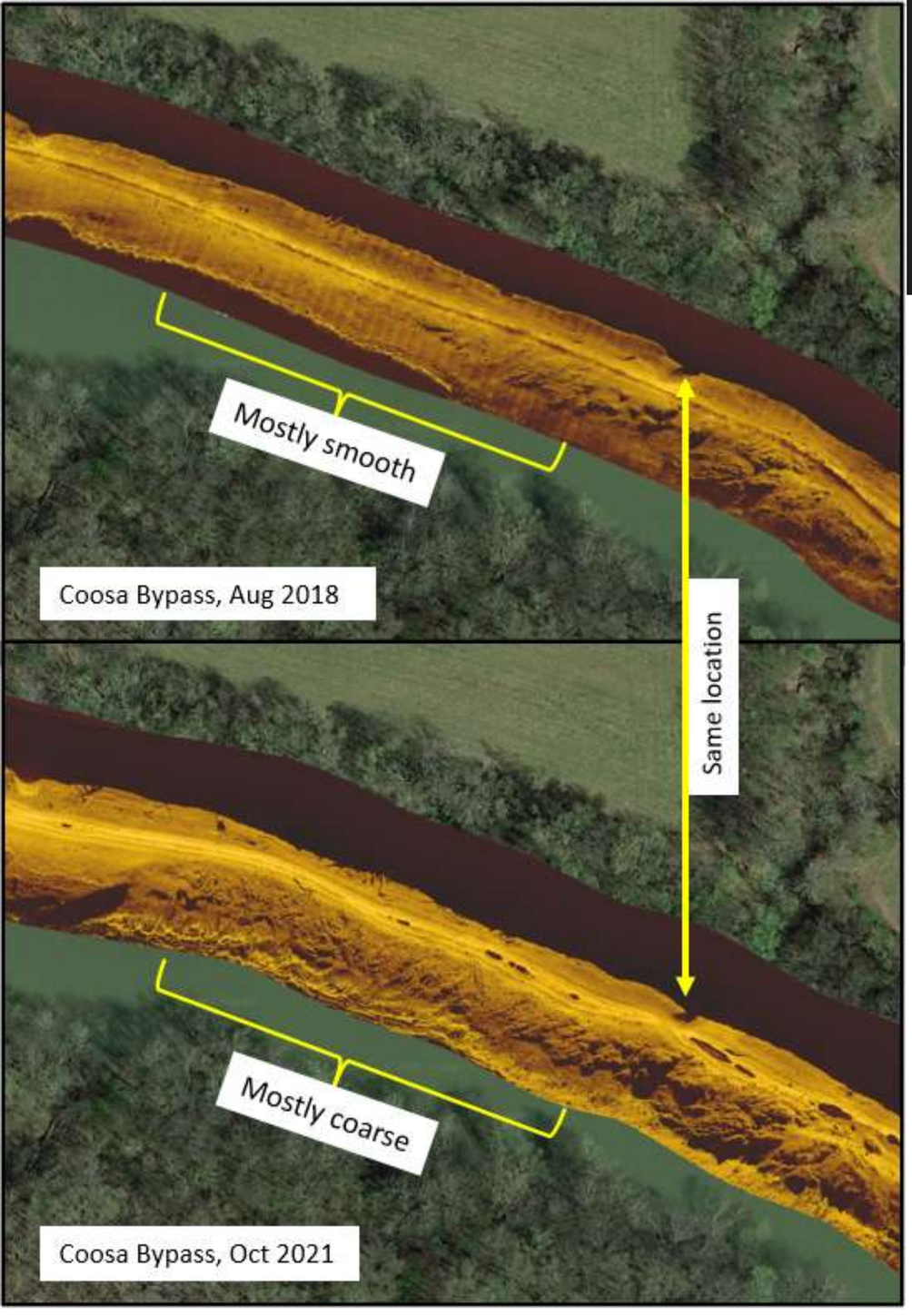


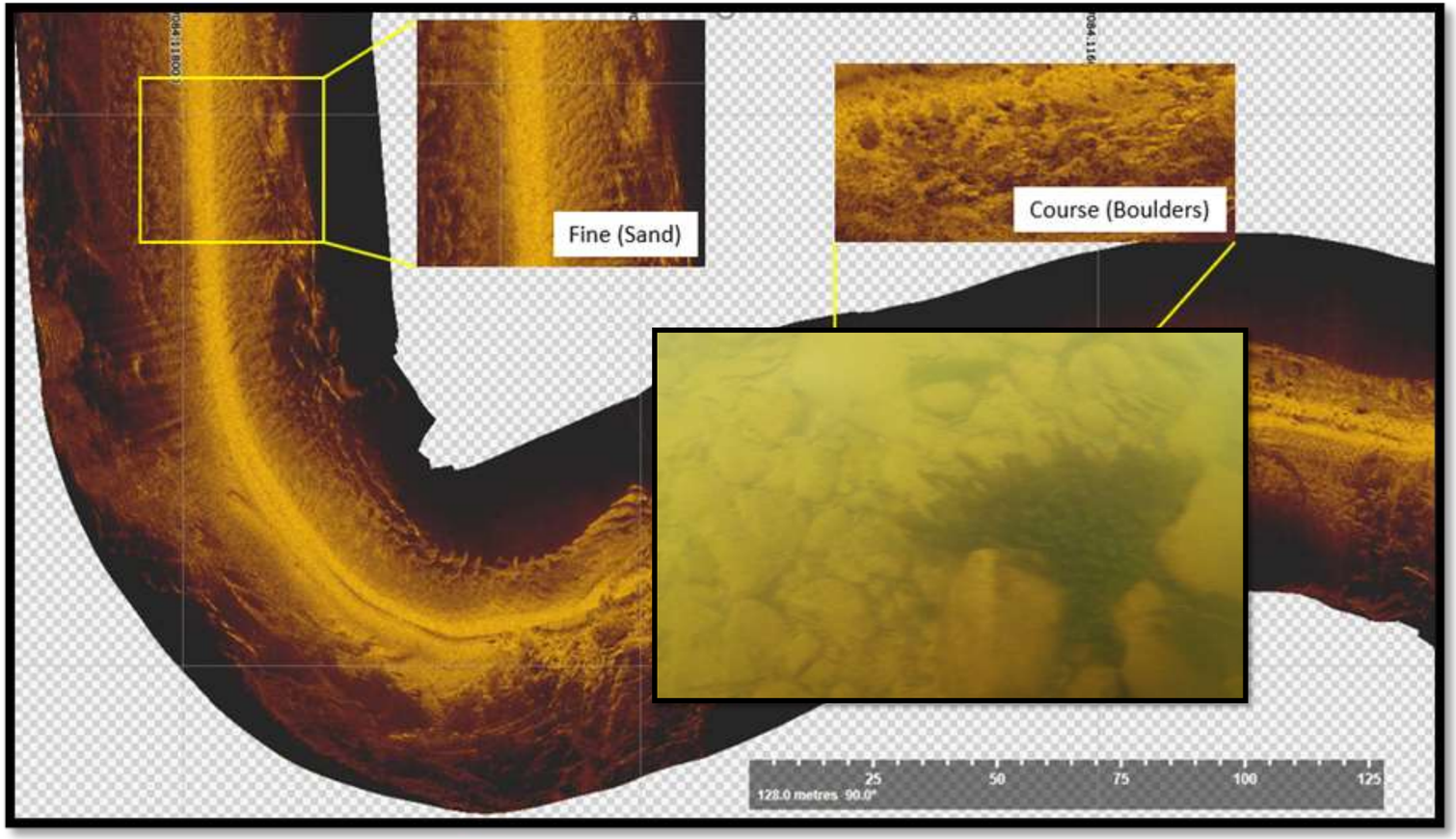
1 Functional

Impaired 5

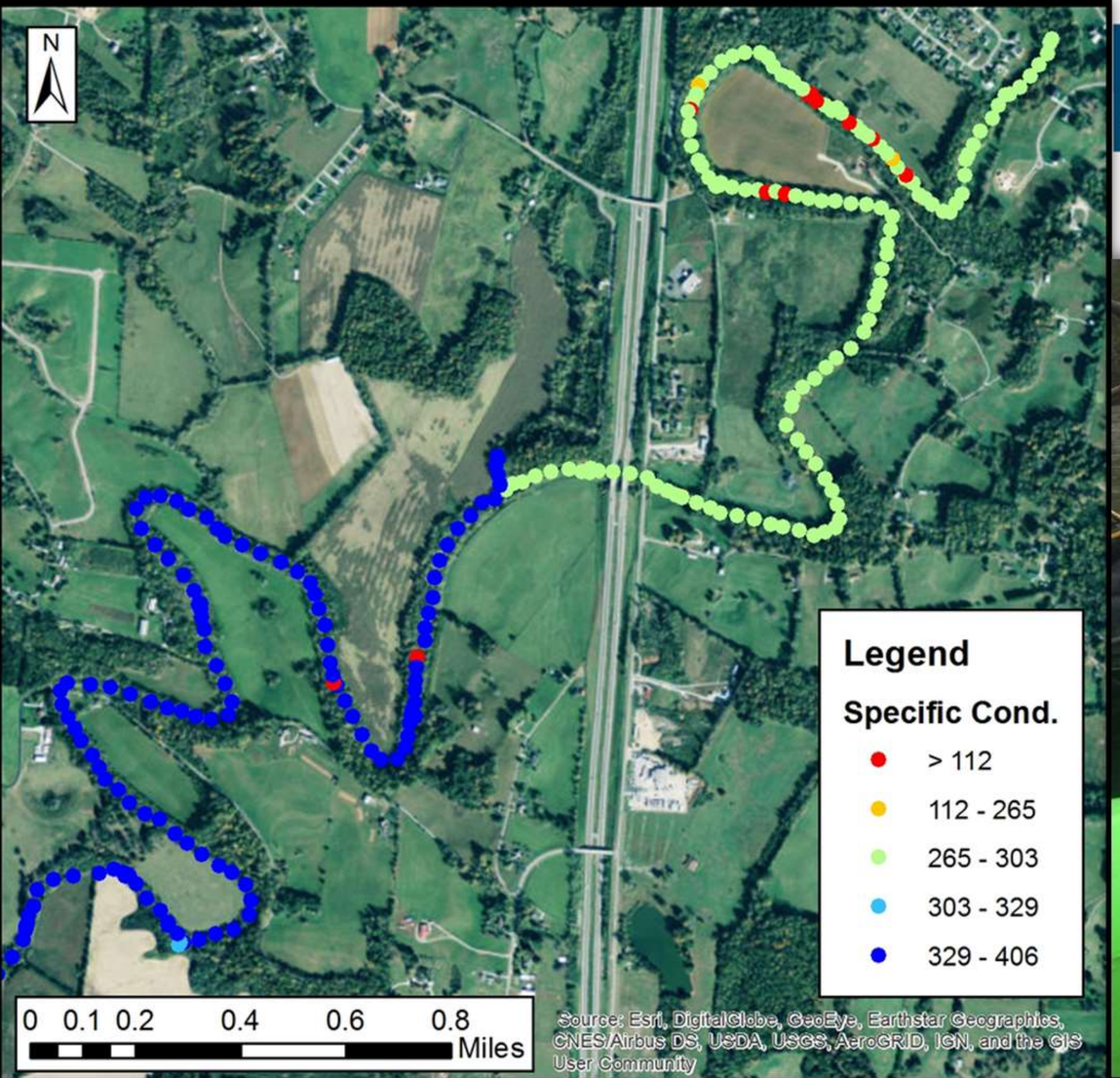
High Definition Stream Survey Methods for a MS4 Stormwater Permit

Streambed Condition
side-scan sonar & video



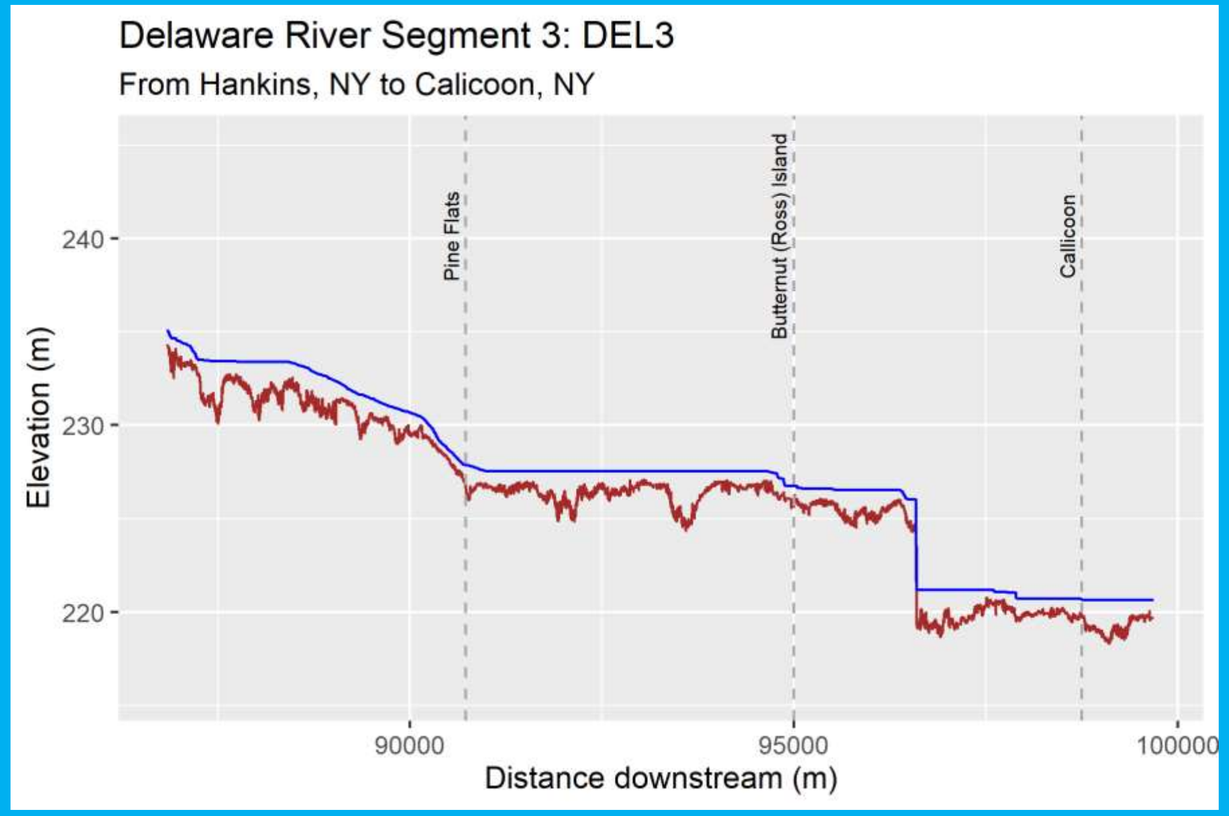


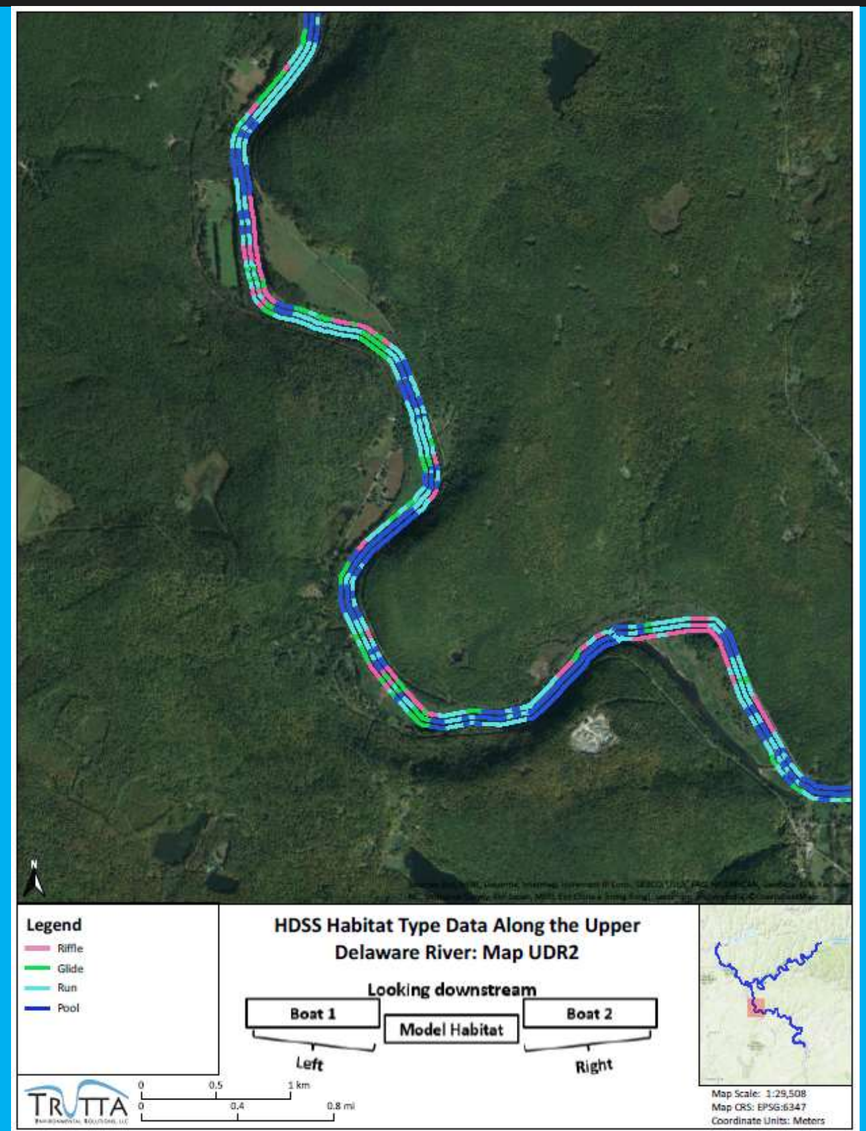
Water Quality Sampling

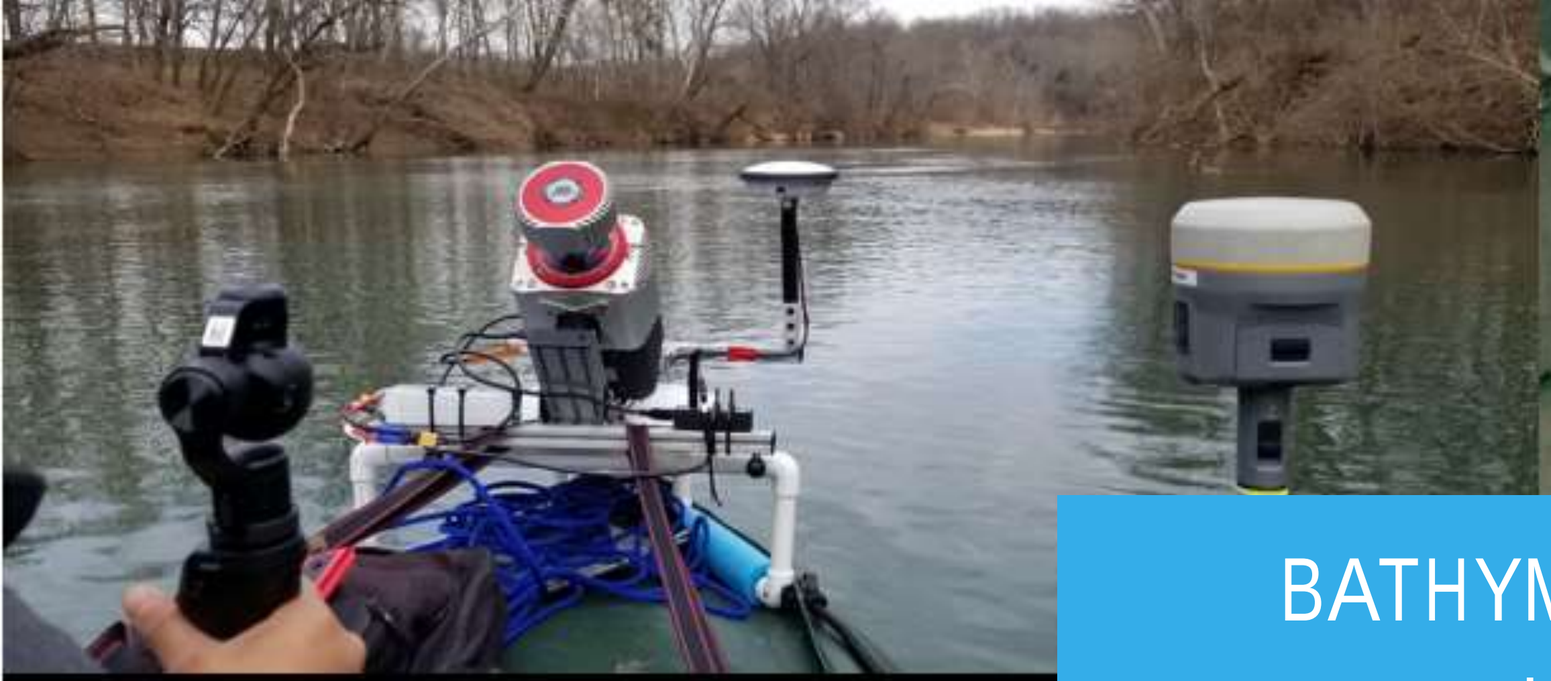


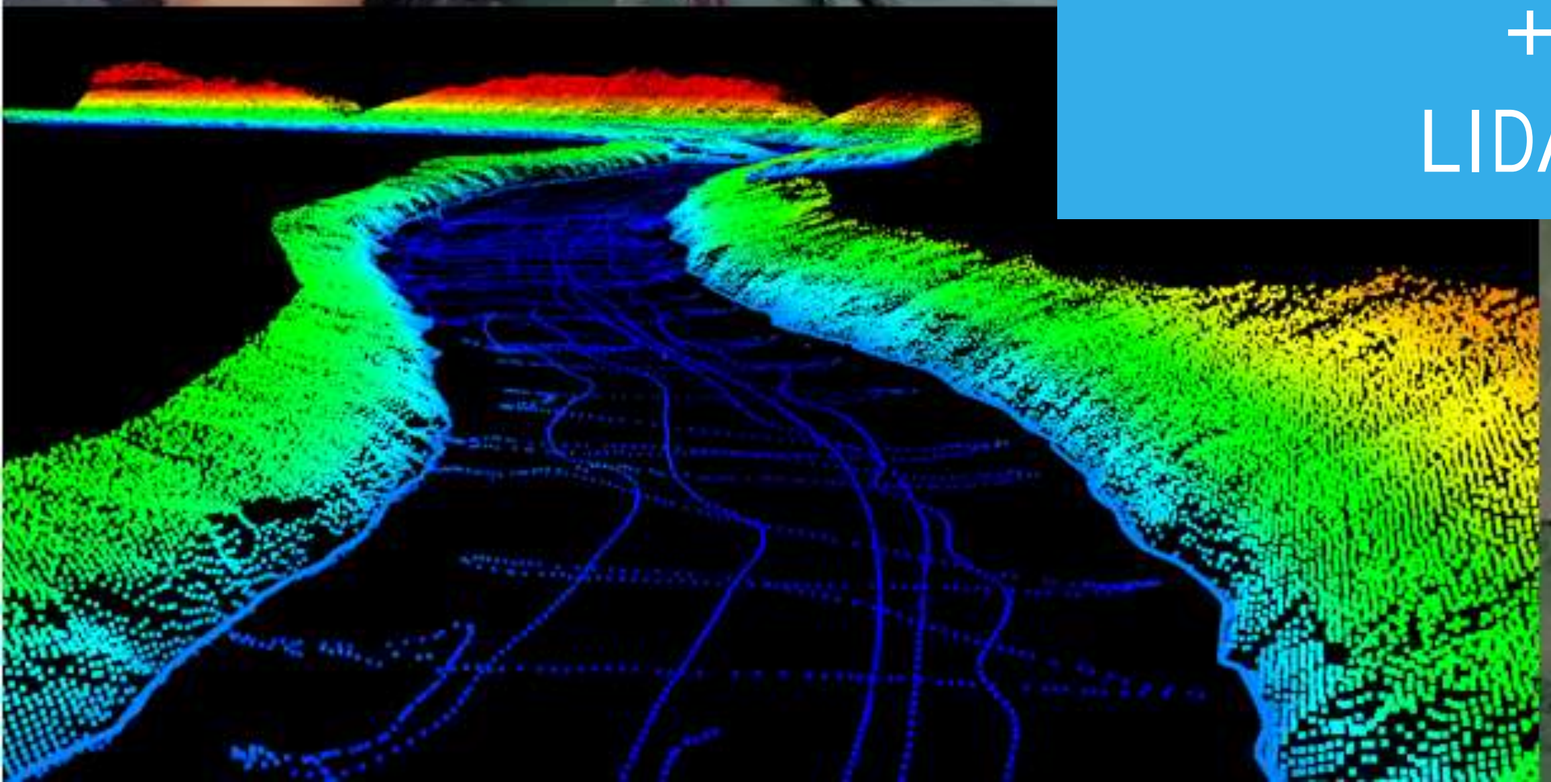
Channel Geomorphology

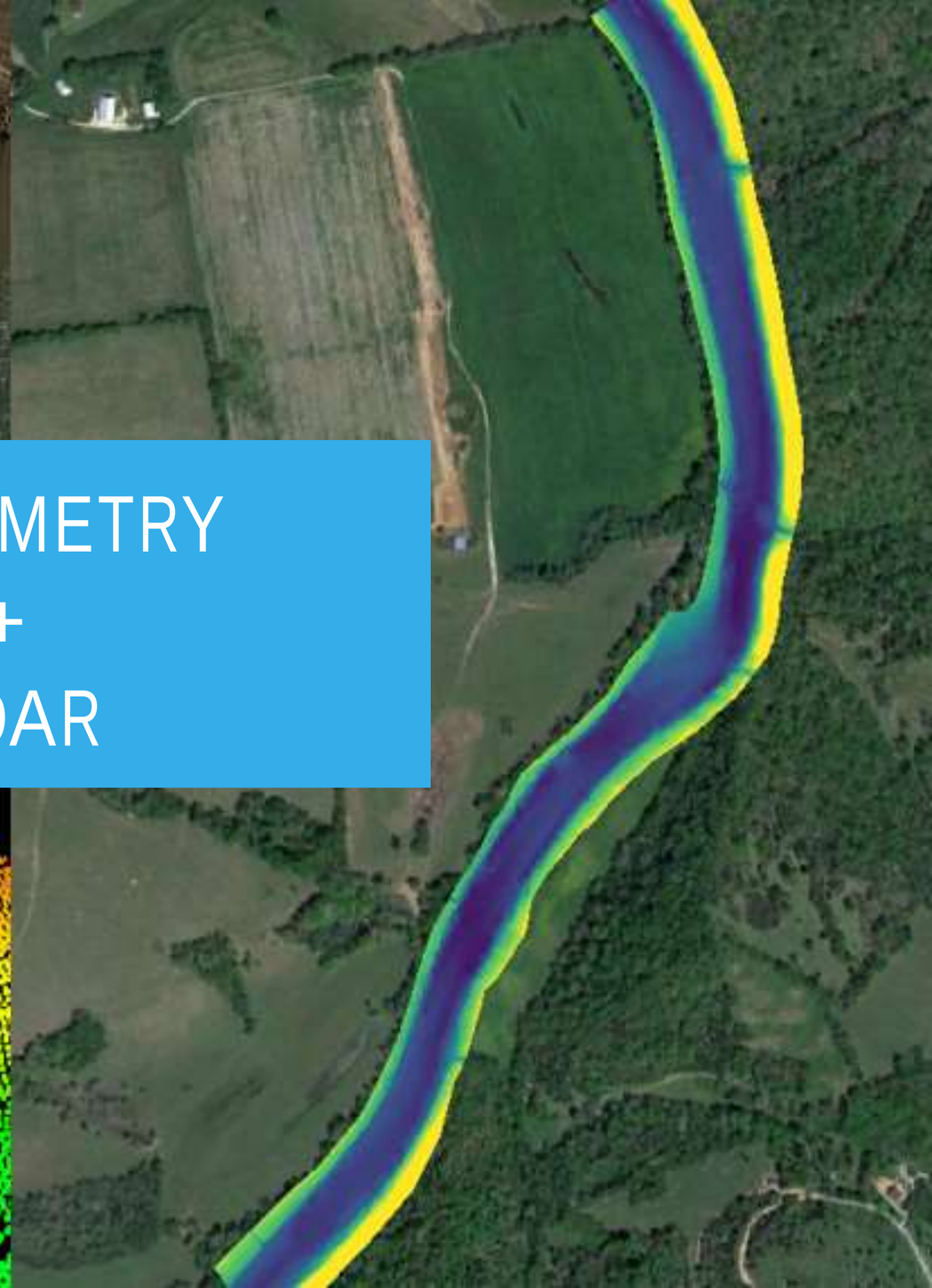
depth, elevation, slope & habitat type





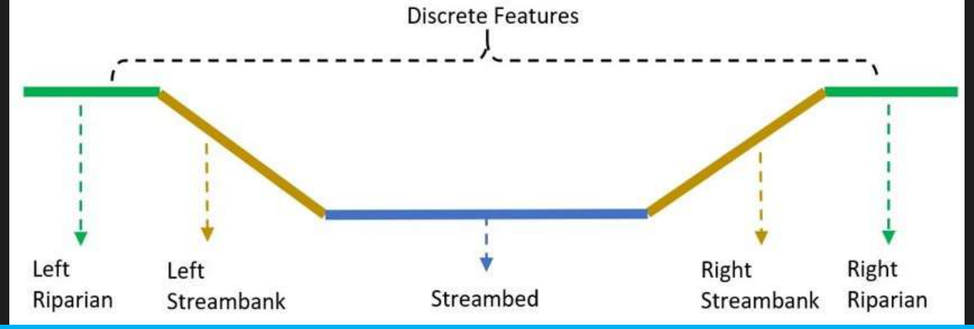






BATHYMETRY
+
LIDAR

discrete feature Condition



Clean Outfall

Illicit Discharge

Site Assessment and Project Suitability

Hydropower

Wildlife

Stormwater
MS4

Transportation

Environmental
& Non-Profits

Water Quality
- Longitudinal Profile
- Tributary input
- Sediment TMDLs
- Point & Non-Point Source Impacts

Water Quantity
- Channel Profiles
- Channel Capacity
- Flood Risk Models
- Drought impacts
- Instream Flow

Habitat
- Riffle, Run, Pool Delineation
- Substrate Types
- Embeddedness
- Instream Cover
- Riparian Condition

HDSS
Cross-sectional Transects and Longitudinal Surveys

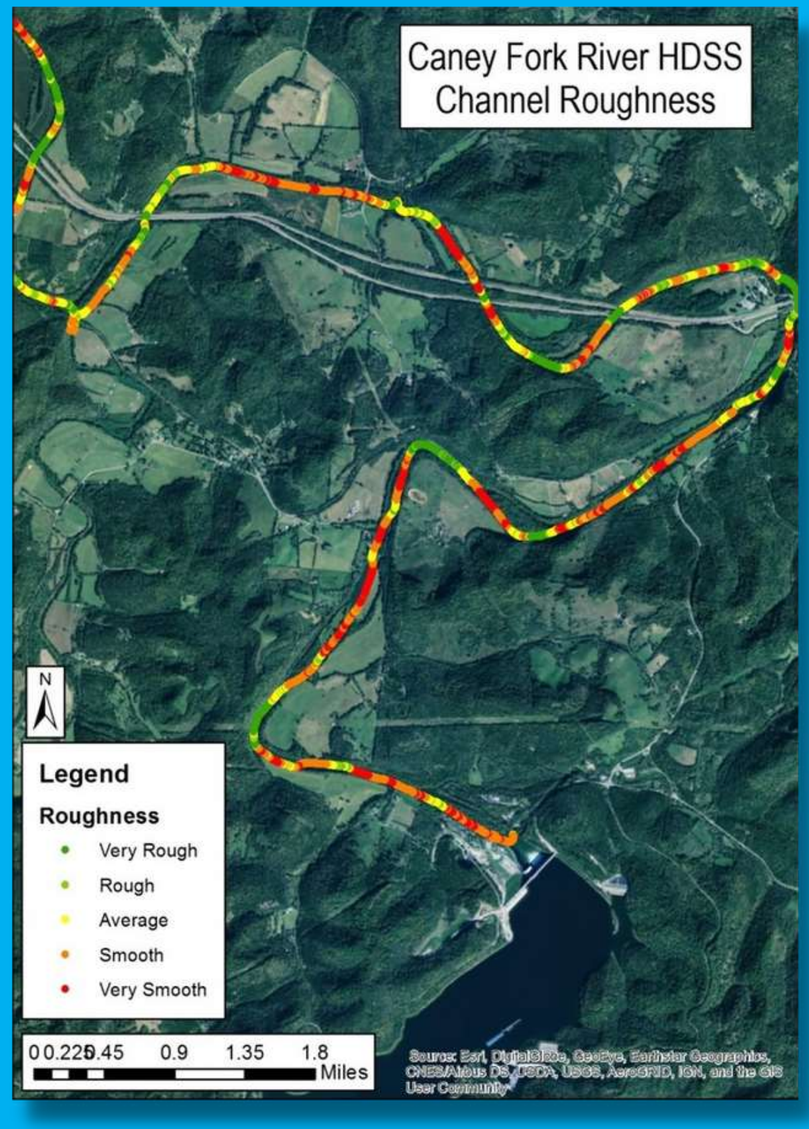
Infrastructure
Location, Extent & Condition of:
- Bridges
- Intakes & Outfalls
- Bank Stabilization
- Dams, etc.

Outreach
- Virtual Stream Tours
- Integrates with Aerial Imagery
- StreamView Dashboards show data and stream conditions

Stream Corridor Assessment
- Current Conditions Archive
- Restoration Prioritization
- Mitigation Potential

Integrated Planning Framework
HDSS supports integrated planning by providing high-quality, multi-attribute, geo-referenced data of the entire stream channel

project suitability: Selecting A Site



Locations with:

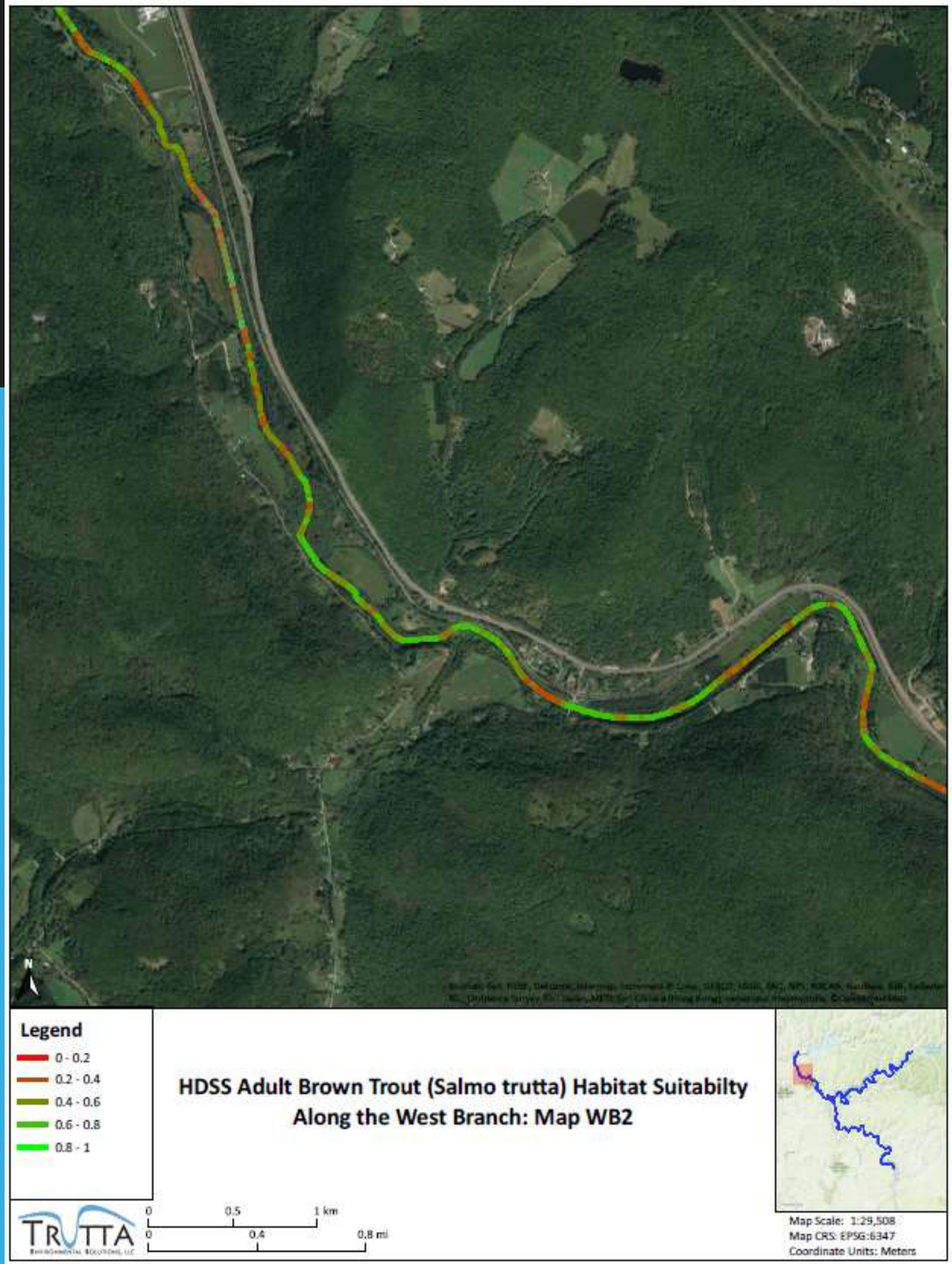
- Highest Ecological Lift
- Greatest Accessibility
- Lowest Cost

Determine most suitable restoration technique

Animal suitability: trout Habitat

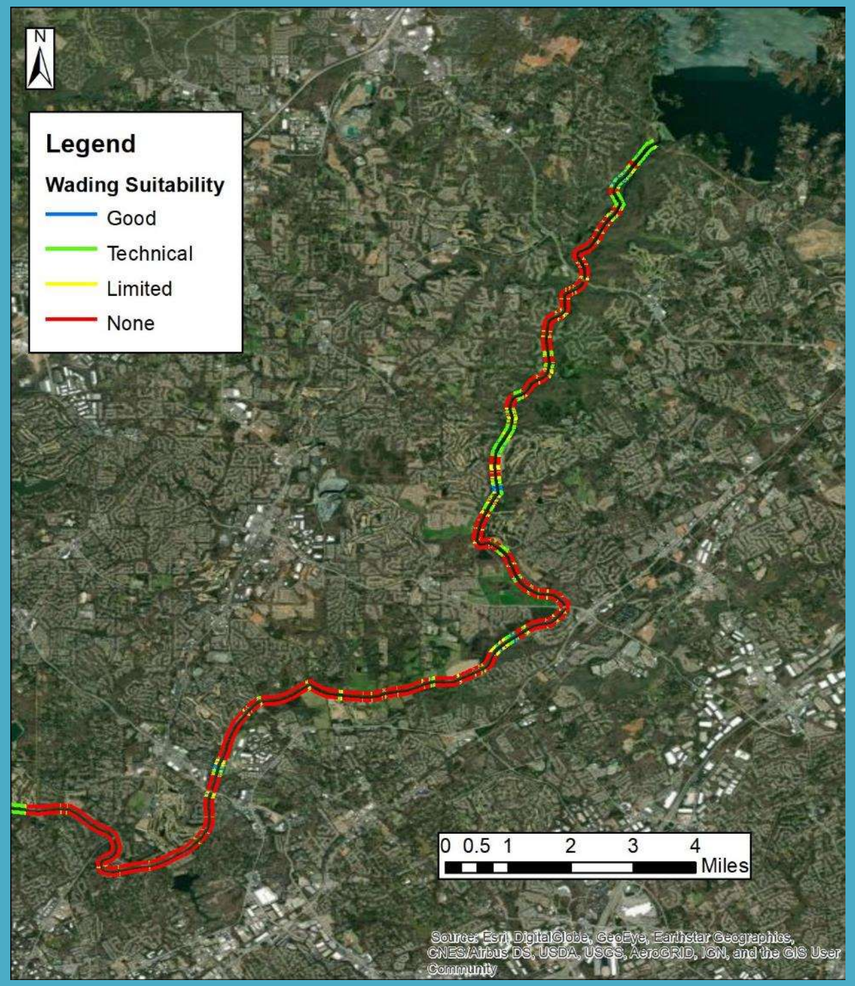
HSI Based on Depth, Velocity, Substrate and Cover

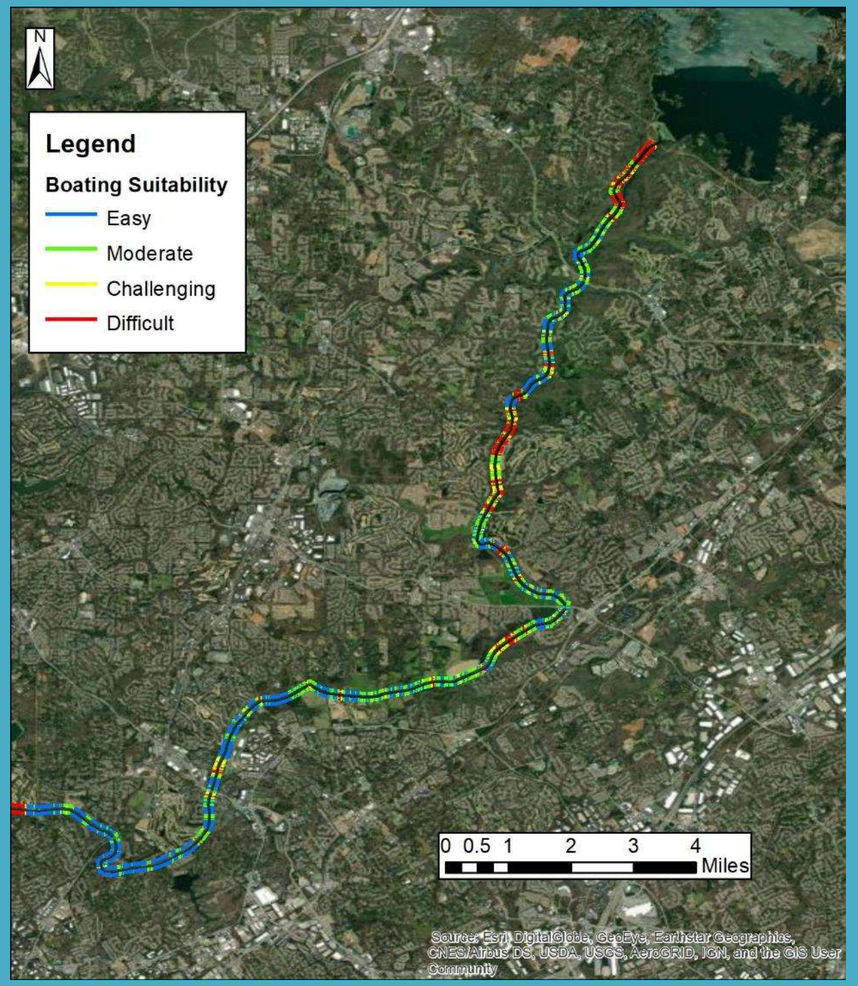
Segment	Brown Trout Adult	Brown Trout Juvenile	Brown Trout Spawning	Rainbow Trout Adult	Rainbow Trout Juvenile
West Branch	0.52	0.53	0.41	0.63	0.64
Upper East Branch	0.45	0.52	0.44	0.56	0.54
Lower East Branch	0.56	0.49	0.38	0.63	0.62
Delaware River	0.63	0.45	0.32	0.67	0.65



General Public Suitability: Recreational Use

Find areas with suitable:
(1) Depth, (2) Roughness and (3) Velocity





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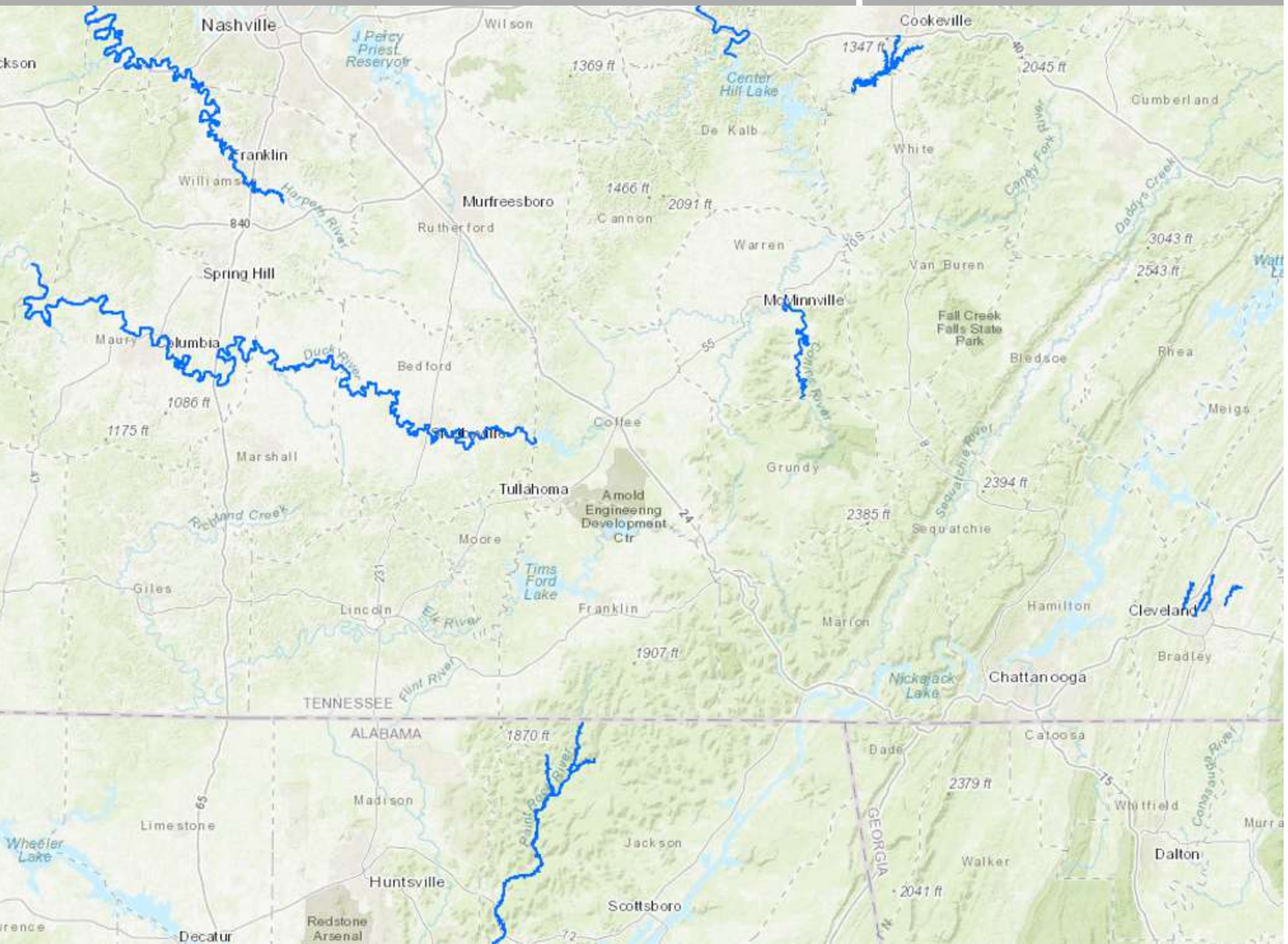
ENVIRONMENTAL SOLUTIONS, LLC

federal, state & local partners



NATIONAL PARK SERVICE

U.S. FISH & WILDLIFE SERVICE
DEPARTMENT OF THE INTERIOR

TN Department of Environment & Conservation

DAR
Hawaii Division of Aquatic Resources

FRIENDS OF THE UPPER DELAWARE RIVER
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1842
TENNESSEE

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CITY OF LEWISBURG TENNESSEE

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The Nature Conservancy

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NASHVILLE, TN ● PANAMA CITY, FL

NAICS CODES:

541620 - Environmental Consulting Services

541360 - Geophysical Surveying & Mapping Services

541690 - Other Scientific and Technical Consulting Services

541712 - Research and Development in the Physical, Engineering & Life Sciences

CERTIFICATIONS:

- SBA 8(a) Certified
- Economically Disadvantaged Women Owned Small Business (EDWOSB) - Certification No. WOSB210739
- Women's Business Enterprise (WBE) - Certification No. WBE2100985
- Women Business Enterprise (WBE-State of Tennessee) - Certificate No. 042619-02
- Qualified MS4 Stormwater Compliance Professional (MS4-SCP) - Certificate No. 2017
- Certified Fisheries Professional (FP-C)

DUNS NUMBER: 080604337

CAGE CODE: 7UFG4

certified WBENC WOMEN'S BUSINESS ENTERPRISE

SBA U.S. Small Business Administration 8(a) CERTIFIED

SBA U.S. Small Business Administration WOSB CERTIFIED

SBA U.S. Small Business Administration EDWOSB CERTIFIED

TRUTTA

ENVIRONMENTAL SOLUTIONS, LLC

BETTER DATA ➡ BETTER DECISIONS = MORE SUCCESS

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