

The N-EWN Knowledge Series

A Continuing Education Series about Engineering with Nature



Tyler Ortego, BC, CE
General Manager, Coastal Solutions
Natrx

Applying Cutting Edge Technology to Engineering with Nature

Tyler Ortego from Natrx will share how advanced technologies such as artificial intelligence and additive manufacturing can be used to fully realize the benefits of nature-based solutions in coastal resilience.

Save the date!

Upcoming webinars will take place the 3rd Thursday of the month.

Jul. 16
12:30pm ET

Tyler Ortego, BC, CE, Natrx
Applying Cutting Edge Technology to Engineering with Nature

Aug. 20
12:30pm ET

Zak Ruehman, PE, University of Georgia
Natural Asset Management is Asset Management: Evaluating Natural Infrastructure from an Asset Management Perspective

Sep. 17
12:30pm ET

Eddie Brauer, PE and Joanna Curran, PhD, USACE
Engineering With Nature® Engineering Practice Guide for Floodplain Benching Projects

Register here: <https://bit.ly/3gR9ADL>

or scan:



1 Continuing Education Credit (CEC) is available to attendees

Recorded webinars will be posted online at:
<https://n-ewn.org/resources/n-ewn-knowledge-seminars/>

Presented by:



Questions? Please contact:
Alex Curwin, LimnoTech
acurwin@limno.com

SAME Resilience COI

Applying Cutting Edge Technology to Engineering with Nature



An aerial photograph of a vast wetland landscape. A winding river flows through the center, surrounded by lush green marshes and small islands of land. The lighting suggests a low sun, creating long shadows and a warm, golden glow. The text is overlaid in the center of the image.

**Natrx technology promotes
a harmonious balance between
the natural and built worlds.**

About Natrix

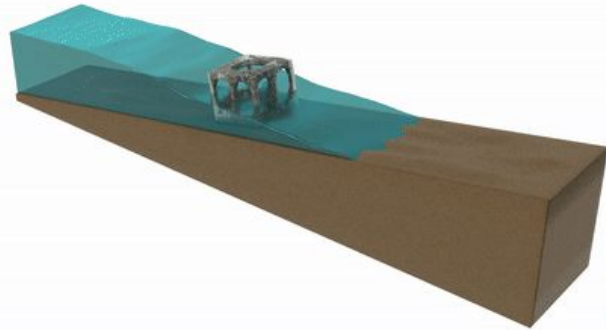


Platform approach to tackling resilience challenges with nature-based technologies

- Comprehensive technology platforms
- Habitat-positive nature based solutions
- Nationwide experience solving complex challenges across an array of use-cases and industries

Preaching to the choir

Time: Year 0



NATRX
CREATED INTO NATURE

Harness the power of natural systems

- **Safety** - Minimize time & material
- **Habitat Friendly** - Create harmony with ecology
- **Effective** - strengthens over time to mitigate erosion



29.1
MILLION

LINEAR FEET ANALYZED
WITH NATRX ASSESS

85+

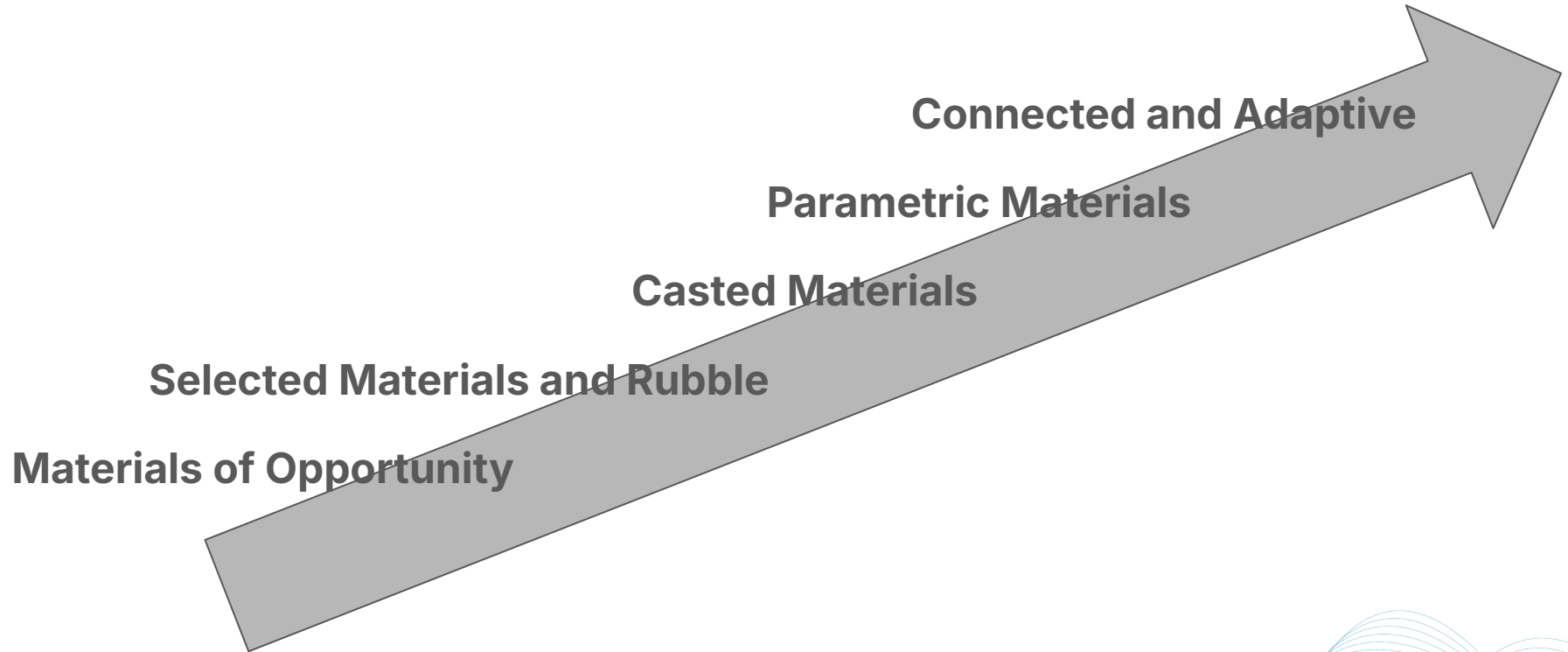
DEPLOYMENTS GLOBALLY

115,000+

UNITS DEPLOYED

**We Partner with
Governments, Landowners
and Conservation Groups
to Build Smarter at Scale**

Marine Reefs as an Analog



Materials of Opportunity



Materials of Opportunity



Materials of Opportunity

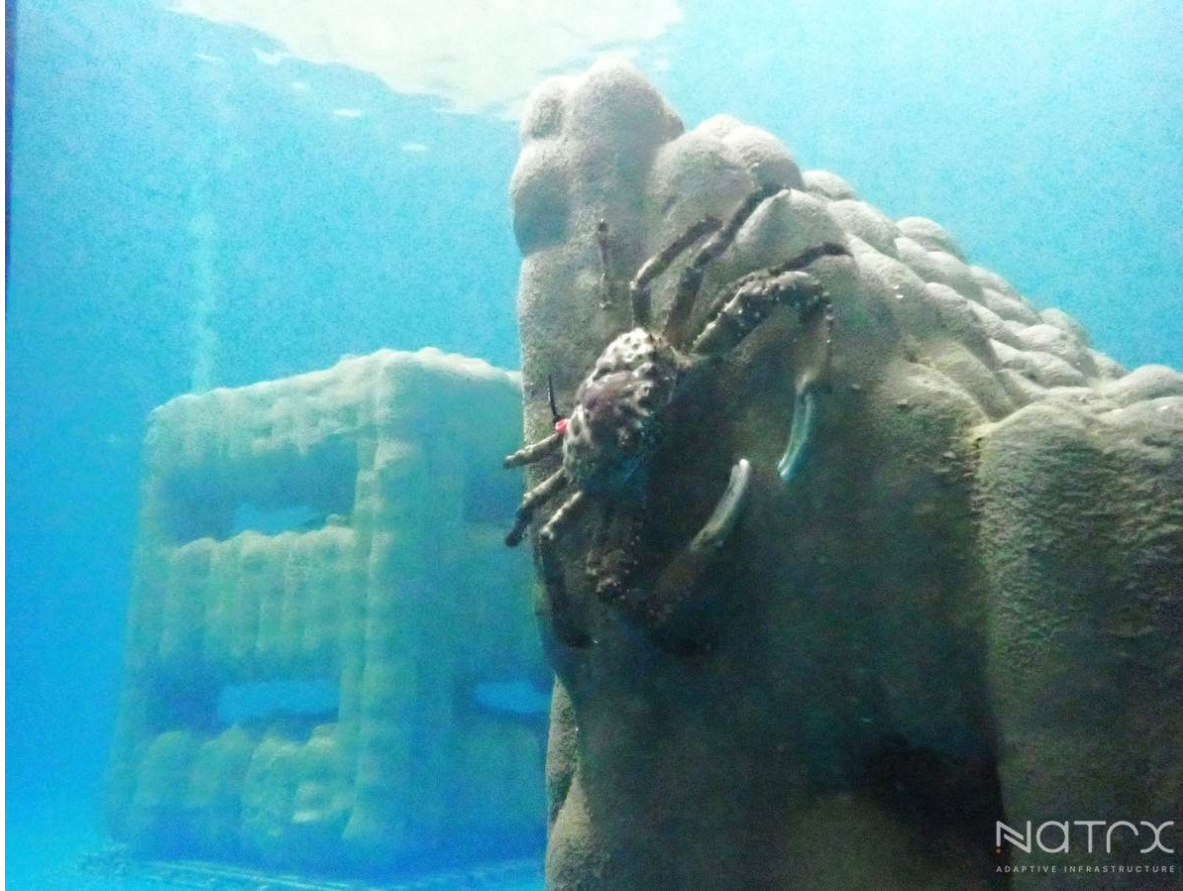


Source: <https://www.facebook.com/mohawkwreck/photos>

Engineered / Casted Materials



Parametric Materials - where Natrx comes in



Parameterizing Parametric Parameters

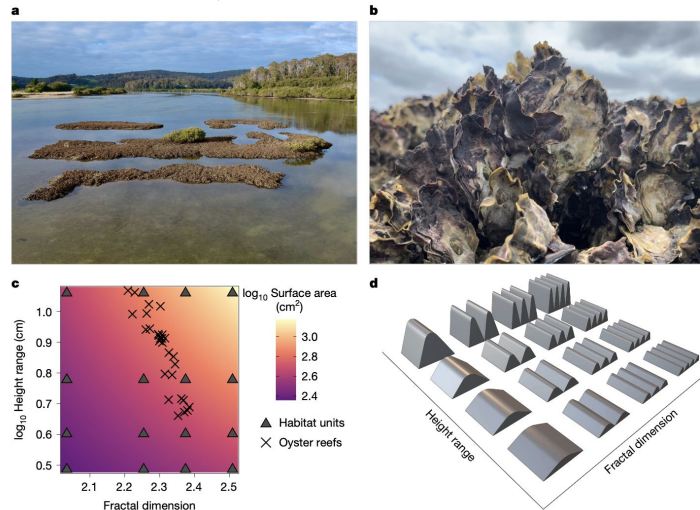


Habitat

- Targeted Features
- Rugosity Index
- Fractal Dimension

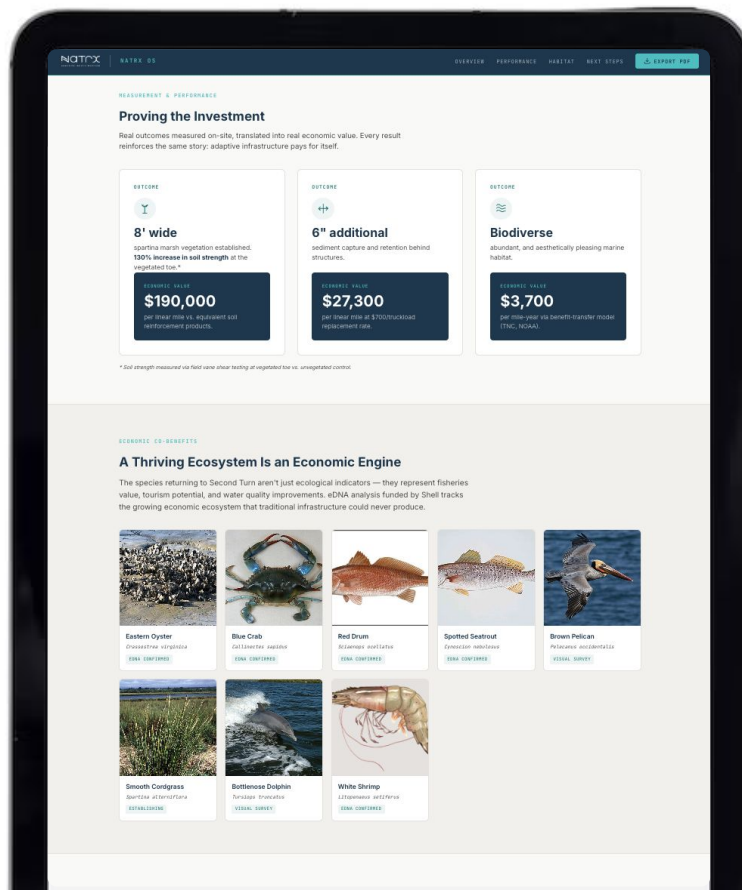
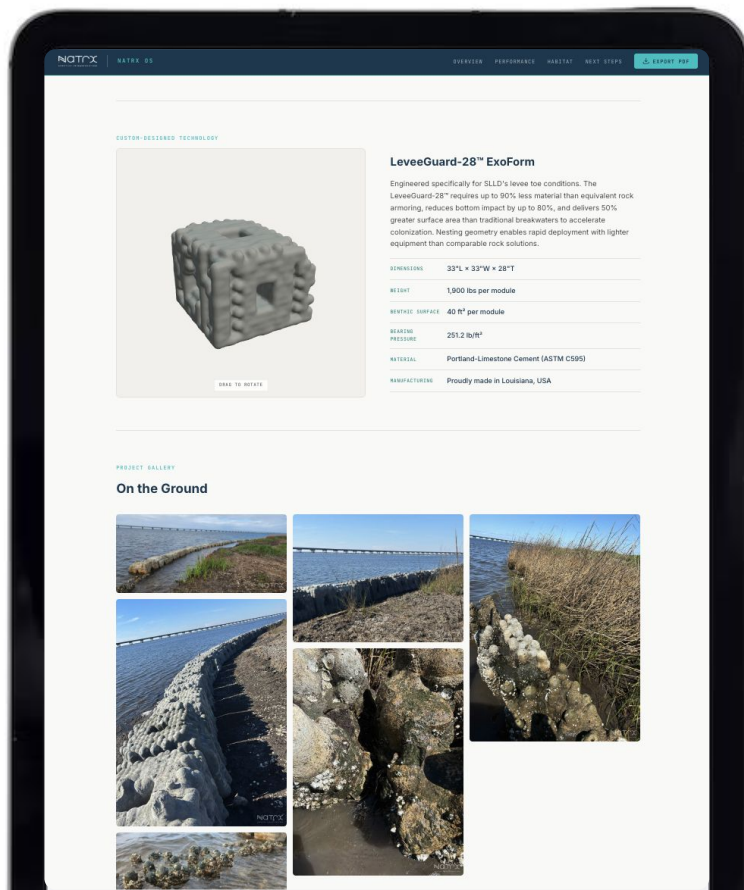
Hydrodynamic

- Crest width, height
- Porosity
- Stability



Source: Esquivel-Muelbert et al 2026

Connected and Adaptive Parametric Materials



It Starts with Natrx Assess



- An AI-powered remote sensing platform for planning, prioritizing, and measuring resilience
- Engineered to evaluate risk and opportunity across entire landscapes
- Synthesizes a diverse range of customizable geospatial data types
- Offers more timely and cost-effective analysis than traditional methods
- Enables proactive planning with high-resolution, site-specific insights

Example Reporting

Powered by multiple data sources

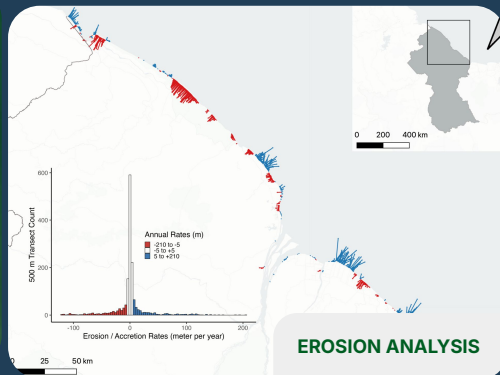
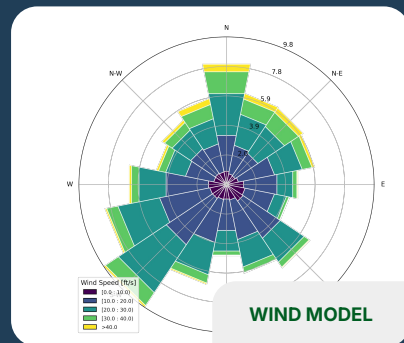
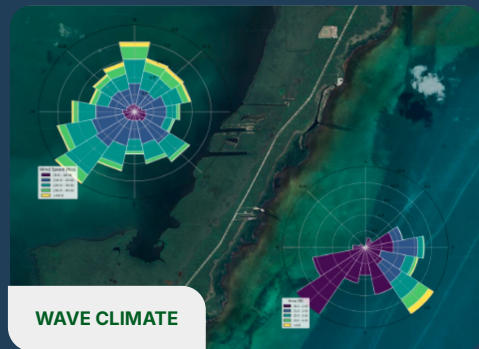
Multispectral imagery, LiDAR, bathymetry, high-resolution drone, and historical archives, ingested and synthesized automatically with built-in QA/QC. Reproducible outputs at up to one-meter or better precision.

Analysis at any scale

From a single parcel to thousands of square miles, without mobilizing a field team.

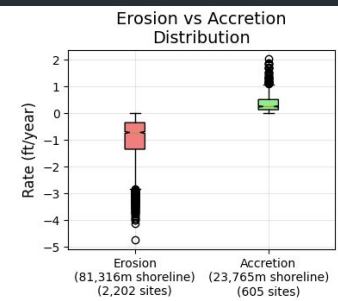
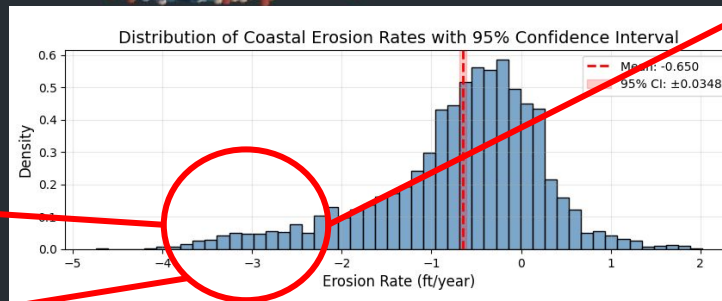
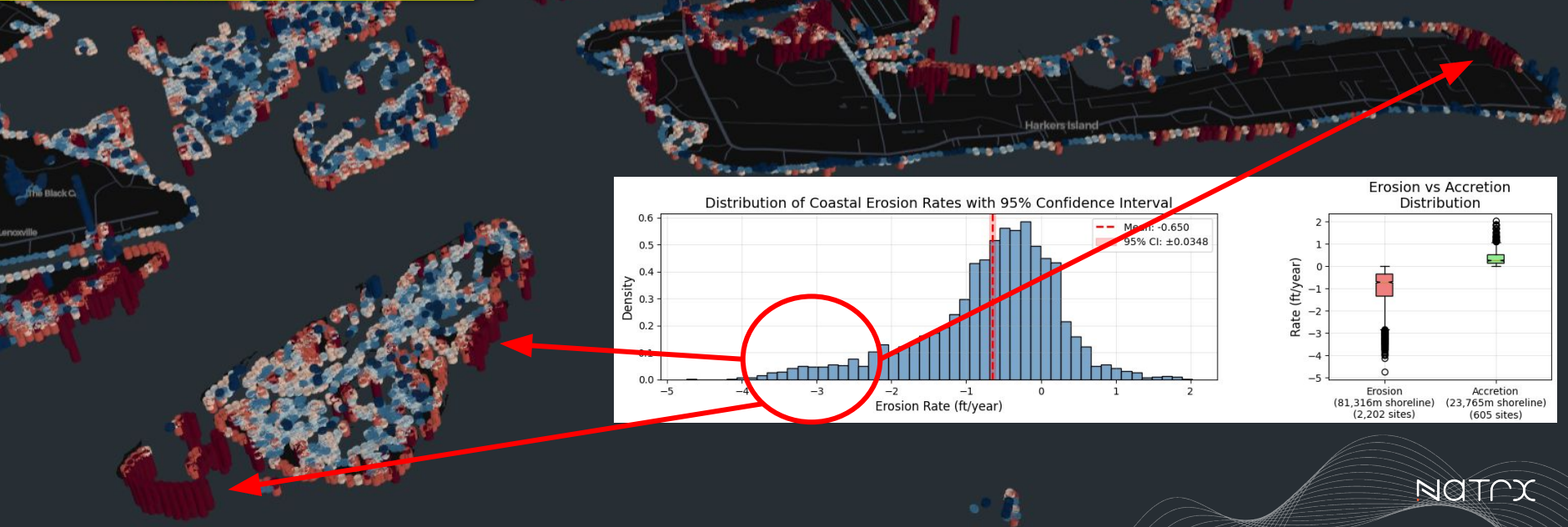
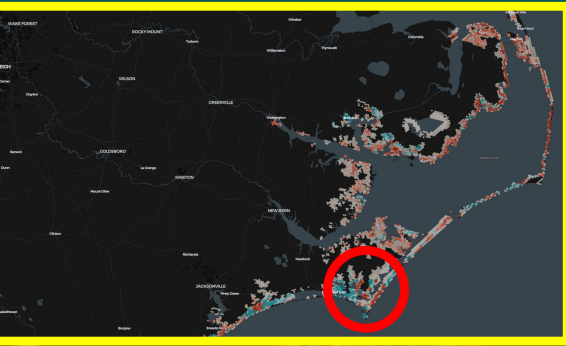
Built-in historical context

Conditions today are understood against years of site history, so you can see where trends are heading and where threats are developing before



NOTE: Above images are examples only.
NatrX Assess reporting can include much more

Large scale shoreline change analysis



Why do it?

Shoreline Change Analysis (SCA) is important for several key reasons

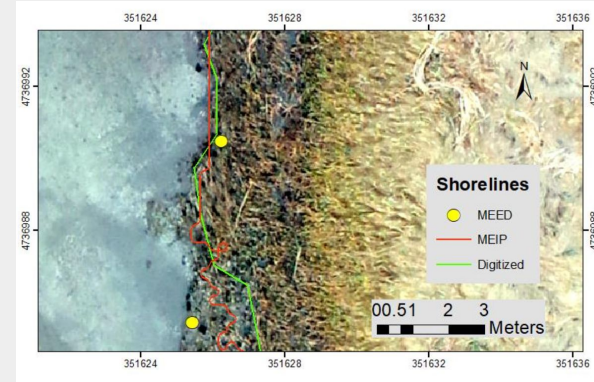
- **Permitting and Justification:** It provides the necessary supportive justification for project actions, which is valuable for customers navigating the permitting process.
- **Informed Decision-Making:** It helps remove bias and informs project decisions by analyzing historical erosion data.
- **Site Suitability:** It establishes specific site parameters, allowing teams to determine if a location is appropriate for lighter solutions (such as oyster shell bags) or if it requires heavier intervention.
- **Project Planning:** It assists in project planning and the creation of a pipeline of sites at regional levels.
- **Condition Documentation:** It provides reasonable erosion rates, along with wind and wave backup, to document site conditions. Have seen great success in this data being useful to acquire additional funds.

Marsh SCA, not beaches

This is not CoastSeg

CoastSeg fills a valuable role in conducting beach SCA. **Natrx Assess focuses on small to large scale *marsh* SCA.**

- Typically use much shorter study periods (want to understand recent SCA)
- Typically higher resolution imagery is used
- Define the shoreline by vegetation line



Marsh Edge From Image Processing

Uses vegetation line as proxy for shoreline position

Simpler to find wide range of data possibilities

Different projects, different needs

North Carolina, Pamlico and Core Sounds

1 meter resolution SCA, 12 year study period

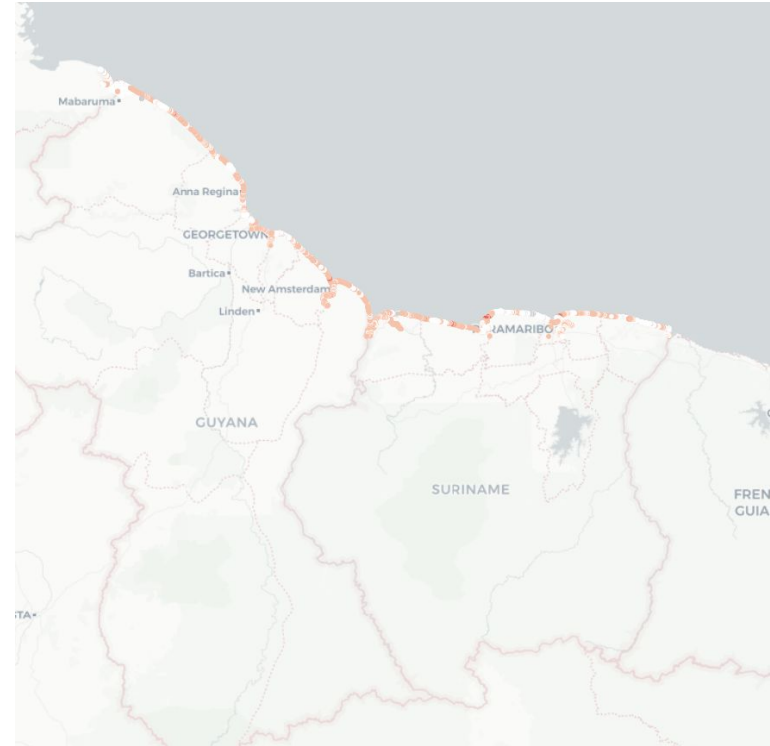
2,909 miles of shoreline



Guyana and Suriname Coastlines

10 meter resolution SCA, 2 year study period

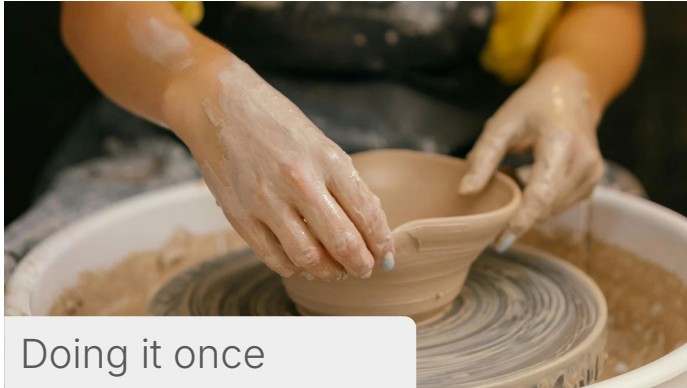
1,556 miles of shoreline



<i>Baseline Period</i>	15	Pixel Resolution						
Erosion Rate [ft/y]	Erosion Rate [m/y]	1	2	3	4	5	10	20
0.5	0.15	2.286 pixels	1.143 pixels	0.762 pixels	0.571 pixels	0.457 pixels	0.229 pixels	0.114 pixels
1.0	0.30	4.572 pixels	2.286 pixels	1.524 pixels	1.143 pixels	0.914 pixels	0.457 pixels	0.229 pixels
1.5	0.46	6.858 pixels	3.429 pixels	2.286 pixels	1.714 pixels	1.372 pixels	0.686 pixels	0.343 pixels
2.0	0.61	9.144 pixels	4.572 pixels	3.048 pixels	2.286 pixels	1.829 pixels	0.914 pixels	0.457 pixels
2.5	0.76	11.430 pixels	5.715 pixels	3.810 pixels	2.857 pixels	2.286 pixels	1.143 pixels	0.571 pixels
3.0	0.91	13.716 pixels	6.858 pixels	4.572 pixels	3.429 pixels	2.743 pixels	1.372 pixels	0.686 pixels
3.5	1.07	16.002 pixels	8.001 pixels	5.334 pixels	4.000 pixels	3.200 pixels	1.600 pixels	0.800 pixels
4.0	1.22	18.288 pixels	9.144 pixels	6.096 pixels	4.572 pixels	3.658 pixels	1.829 pixels	0.914 pixels
4.5	1.37	20.574 pixels	10.287 pixels	6.858 pixels	5.143 pixels	4.115 pixels	2.057 pixels	1.029 pixels
5.0	1.52	22.860 pixels	11.430 pixels	7.620 pixels	5.715 pixels	4.572 pixels	2.286 pixels	1.143 pixels
5.5	1.68	25.146 pixels	12.573 pixels	8.382 pixels	6.286 pixels	5.029 pixels	2.515 pixels	1.257 pixels
6.0	1.83	27.432 pixels	13.716 pixels	9.144 pixels	6.858 pixels	5.486 pixels	2.743 pixels	1.372 pixels
6.5	1.98	29.718 pixels	14.859 pixels	9.906 pixels	7.429 pixels	5.944 pixels	2.972 pixels	1.486 pixels
7.0	2.13	32.004 pixels	16.002 pixels	10.668 pixels	8.001 pixels	6.401 pixels	3.200 pixels	1.600 pixels
7.5	2.29	34.290 pixels	17.145 pixels	11.430 pixels	8.572 pixels	6.858 pixels	3.429 pixels	1.714 pixels
8.0	2.44	36.576 pixels	18.288 pixels	12.192 pixels	9.144 pixels	7.315 pixels	3.658 pixels	1.829 pixels
8.5	2.59	38.862 pixels	19.431 pixels	12.954 pixels	9.715 pixels	7.772 pixels	3.886 pixels	1.943 pixels
9.0	2.74	41.148 pixels	20.574 pixels	13.716 pixels	10.287 pixels	8.230 pixels	4.115 pixels	2.057 pixels
9.5	2.90	43.434 pixels	21.717 pixels	14.478 pixels	10.858 pixels	8.687 pixels	4.343 pixels	2.172 pixels
10.0	3.05	45.720 pixels	22.860 pixels	15.240 pixels	11.430 pixels	9.144 pixels	4.572 pixels	2.286 pixels

R's of data science

Repeatability * Reproducibility * Replicability



Doing it once

Misperception: the algorithm is the hard part.



Doing it many times

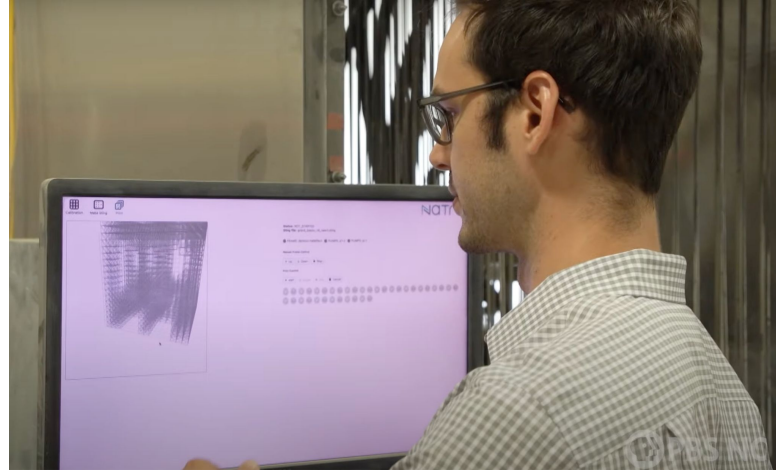
Reality: Consistently and reliably running an analysis is hard.

Take Action with Natrx Address

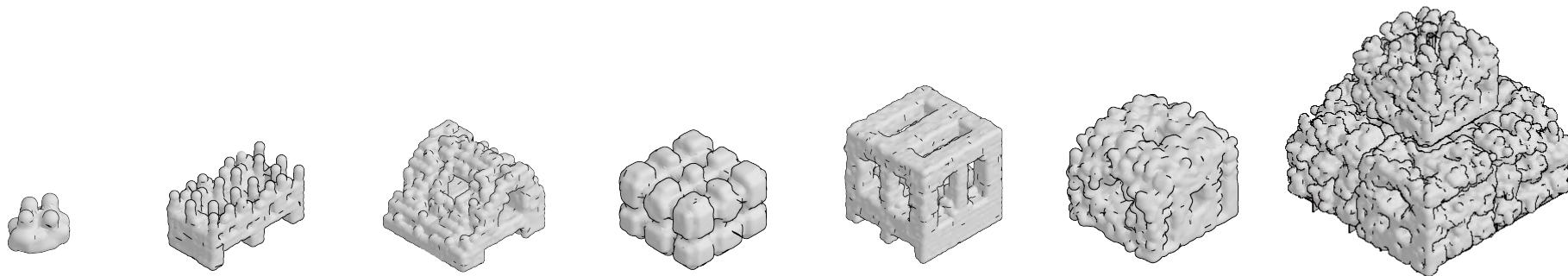


- Advanced manufacturing process and modular solutions for solving problems
- Proprietary design and manufacturing allows for fast installation and high-performance using less material
- Designed for intelligent water energy control
- Complex geometry and increased surface area promote biodiversity
- Design process helps overcome permitting challenges and accelerates project approval times

Natrx Dry Forming™ Technology - Designed for Water



A Complete Range of Shape and Application Configurations



EZ-Form-9
50lbs

WaveBrush-18
500lbs

WaveSlope-24
1,200lbs

Lattice-24
1,200lbs

FishHouse
1,600lbs

LeveeGuard-28
1,900lbs

CoralForm
12,000lbs

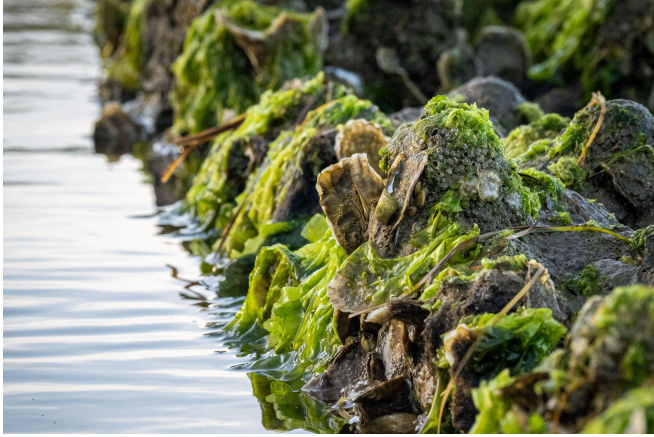
Design

- Geometric complexity
- High surface area
- Rapid design iteration
- Straightforward knowledge transfer
- A fraction of the material used in traditional methods

Benefits

- Energy dissipation
- Sediment deposition
- Habitat creation
- Increased biodiversity

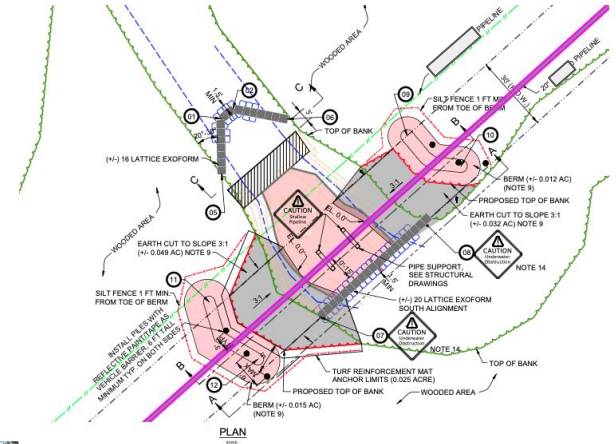
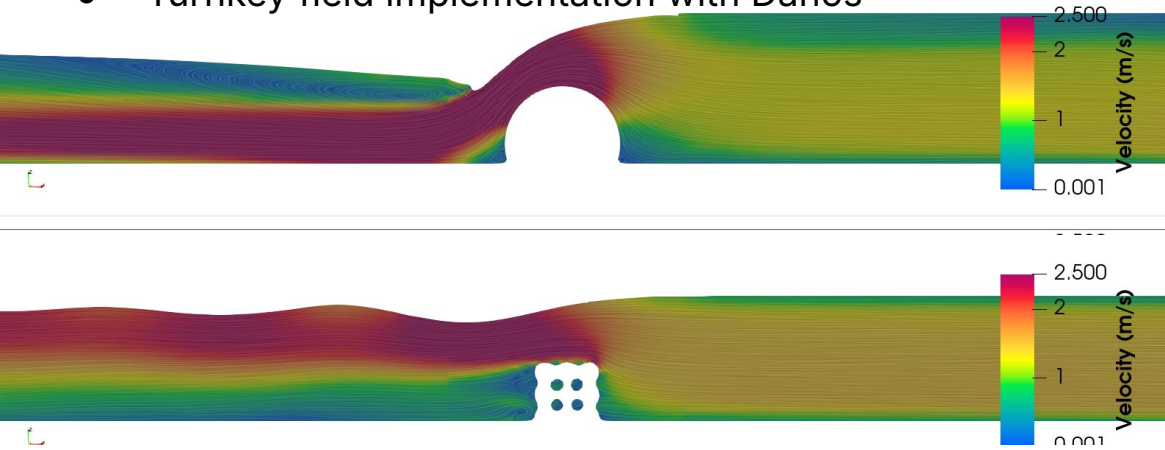
Example Installations



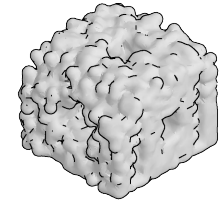
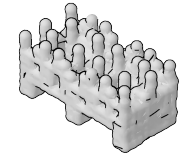
NatrX Address: Stream Crossing Example

Nature Based Sediment Control

- Four sites, \$3M+ savings (75%) vs matting
- ExoForms™ induce sedimentation onto pipe
- Validated with CFD services
- Turnkey field implementation with Danos



Second Turn Project Example



Monitor and Measure with Natrx Appraise



- Measure the impact of resilience and restoration actions
- Measure vegetative health, erosion hotspots, biodiversity
- Provide clarity and a sense of assurance
- Quantify the value of shoreline solutions
- Support nutrient, biodiversity, and carbon credit development activities
- Receive data-driven recommendations for improvement

From data to context

Species appendix — all detected (21 of 45)

Compact reference list. Use filters to narrow taxa. Notable species are also highlighted above.

☐ Show genus-level ☐ Show family-level

☒ Actinopterygii ☐ Animalia ☐ Chromista ☒ Mollusca ☐ Plantae ☐ Unknown

Name	Group	Sources	Detections	Confidence	Quotes
 Atlantic croaker <i>micropogonias undulatus</i>	Actinopterygii		2	100%	— ☆
 Atlantic silverside <i>menidia peninsulae</i>	Actinopterygii		2	100%	— ☆
 flathead mullet <i>mulgii cephalus</i>	Actinopterygii		2	100%	— ☆
 Gulf menhaden <i>brevoortia patronus</i>	Actinopterygii		2	100%	— ☆
 hardhead catfish <i>ariopsis felis</i>	Actinopterygii		2	100%	— ☆
 Red drum <i>sciaenops ocellatus</i>	Actinopterygii		2	100%	— ☆
 Alligator gar <i>atractosteus spatula</i>	Actinopterygii		1	100%	— ☆
 Atlantic needlefish <i>strongylura marina</i>	Actinopterygii		1	100%	— ☆
 Bay Anchovy <i>anchoa mitchilli</i>	Actinopterygii		1	100%	— ☆
 Black Drum <i>pogonias cromis</i>	Actinopterygii		1	100%	— ☆

Species appendix — all detected (100)

Compact reference list. Use filters to narrow taxa. Notable species are also highlighted above.

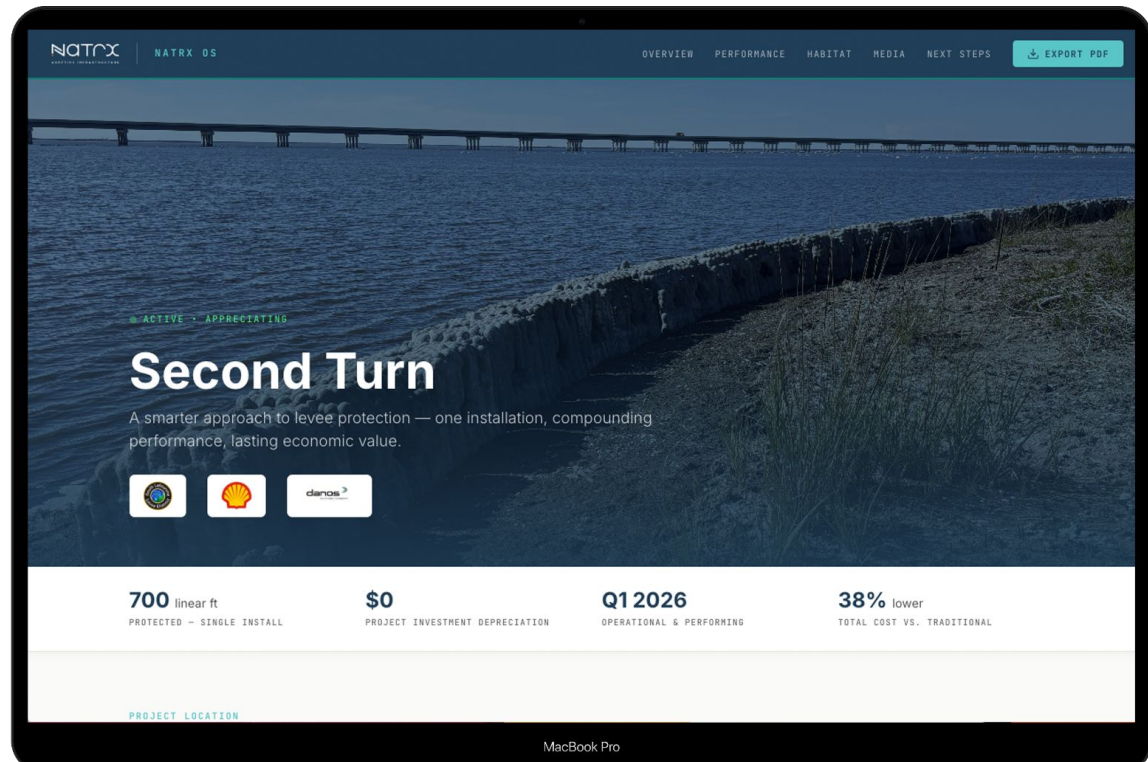
☒ Show genus-level ☐ Show family-level

☒ Aves

Name	Group	Sources	Detections	Confidence	Quotes
 Roseate Spoonbill <i>platalea ajaja</i>	Aves		235	35%	— ☆
 Clapper Rail <i>rallus crepitans</i>	Aves		185	83%	— ☆
 White Ibis <i>eudocimus albus</i>	Aves		174	32%	— ☆
 Red-winged Blackbird <i>agelaius phoeniceus</i>	Aves		141	96%	— ☆
 Laughing Gull <i>leucophaeus atricilla</i>	Aves		138	100%	— ☆
 Eastern Meadowlark <i>sturnella magna</i>	Aves		99	100%	— ☆
 Savannah Sparrow <i>passerculus sandwichensis</i>	Aves		90	88%	— ☆
 Royal Tern <i>thalasseus maximus</i>	Aves		87	99%	— ☆
 Boat-tailed Grackle <i>quisqualis major</i>	Aves		82	97%	— ☆
 American Crow <i>corvus brachyrhynchos</i>	Aves		77	99%	— ☆

Appraise: Natrx OS Sites Engage the Community

Connected
signage brings
your project to
life



Applying Technology To Nature Based Solutions

Lessons Learned



Economic



Functional

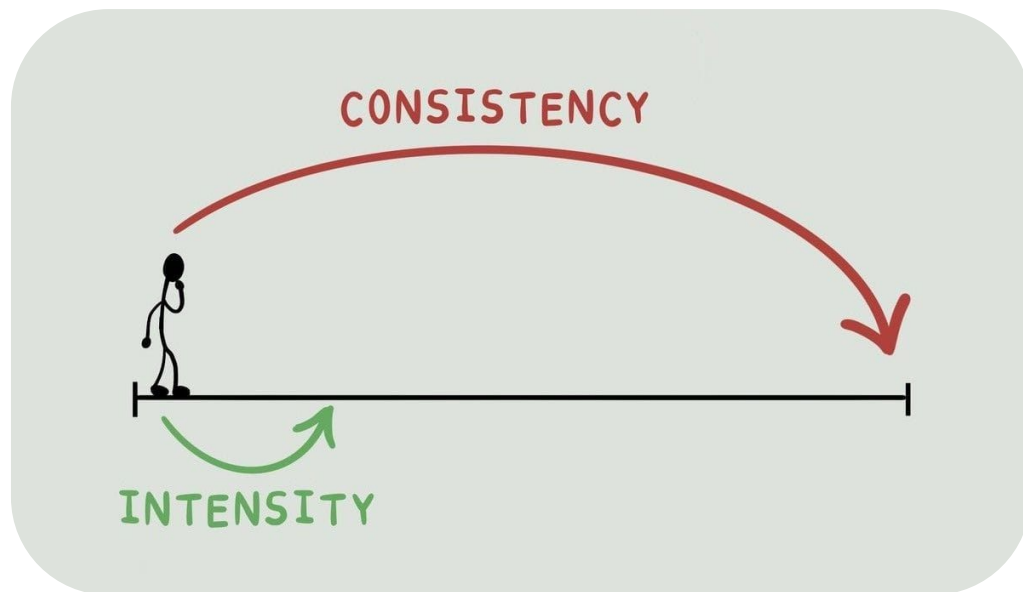


Environmental

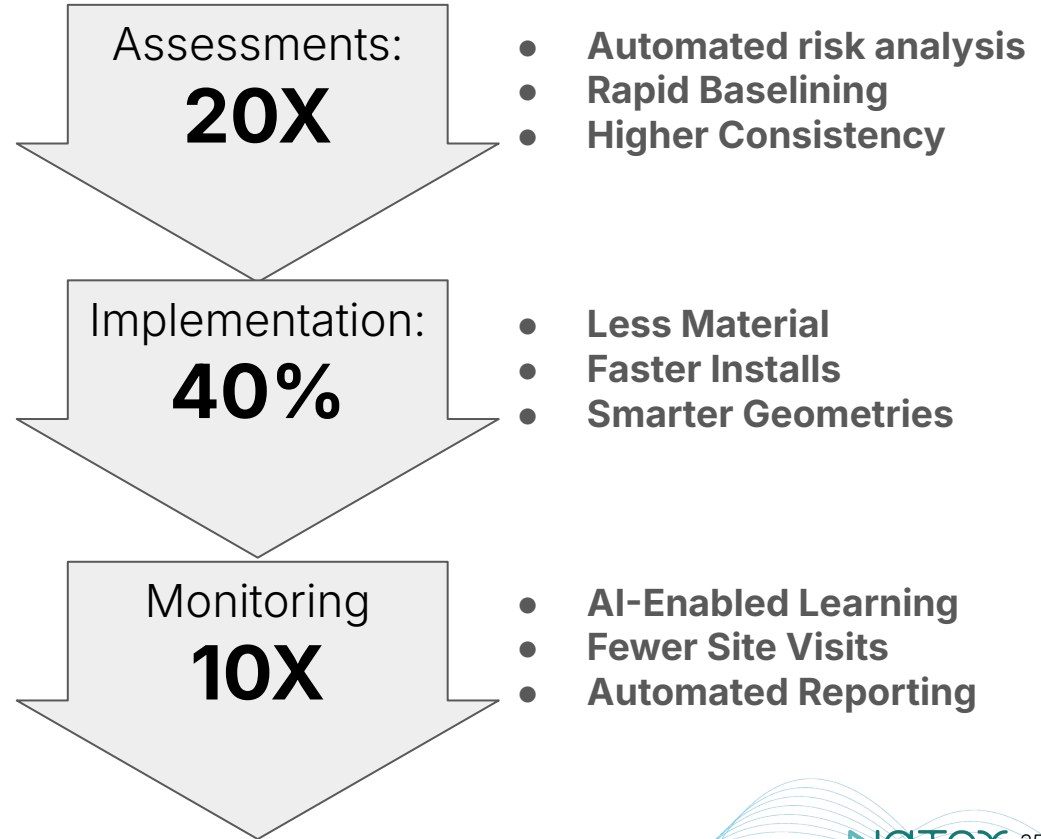
Lessons Learned

AI alone is not a solution

- AI should be used carefully to achieve practical outcomes
- Care must be taken to ensure consistency
- Garbage-in-Garbage out problems can be accelerated without data prep automation and processes.



Bending the Cost Curve



Opportunities for Better Habitat are Everywhere We Build



Stormwater Management



Transportation and Water Infrastructure.



Data Centers and Energy Corridors

Diverse Local Needs: Advanced manufacturing can help here!



Call to Action

- What are opportunities to build an easy button?
- How can we make procurement rules work for nature?



Thank you!

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