



*Autonomous Systems for SAV Restoration:
Field Results from Virginia's Eastern Shore*



Limited logistics drive restoration.

Virginia's coastal bays host the most successful SAV restoration effort ever.

~12K

Acres restored

70+

Million seeds broadcast

26

Years of work

However, labor bottlenecks scale.

In 2022, a record year:

79

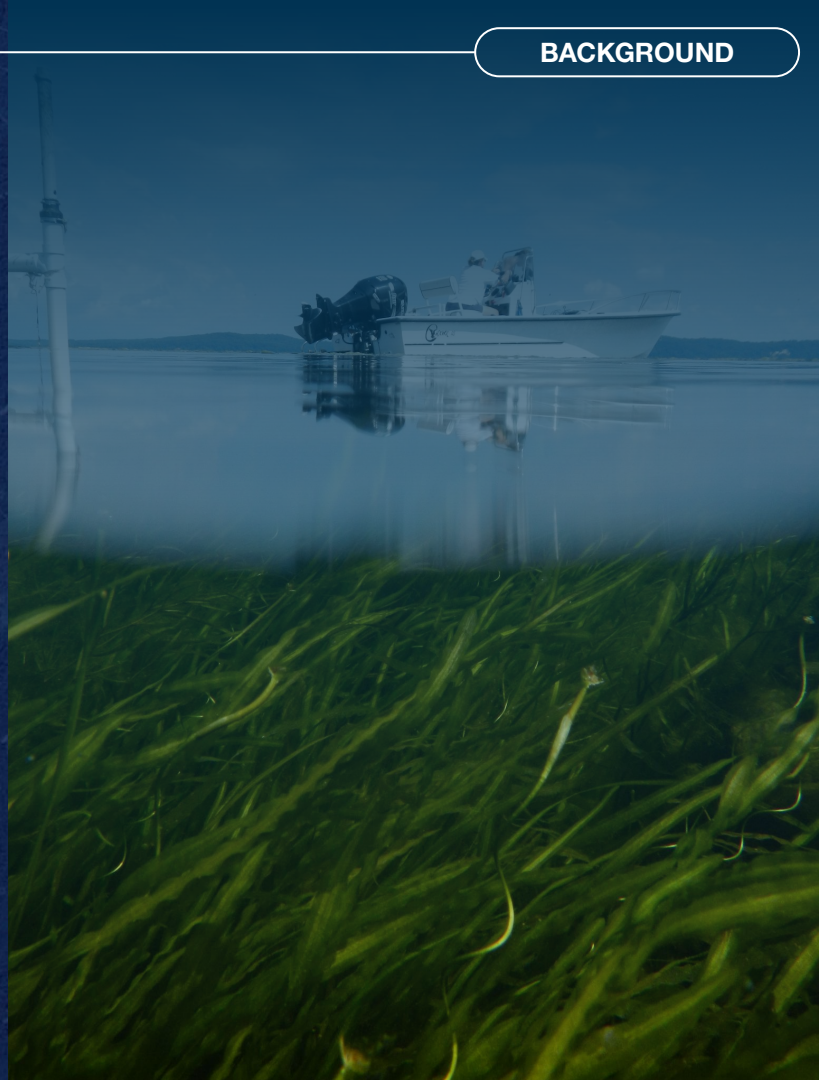
Volunteers

10

Million seeds collected

287

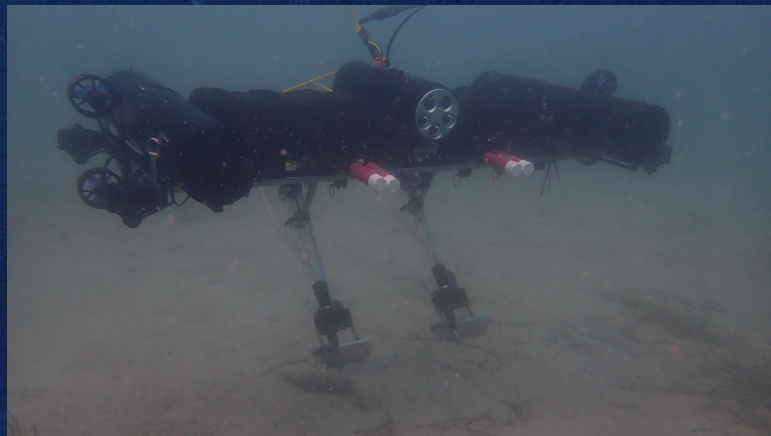
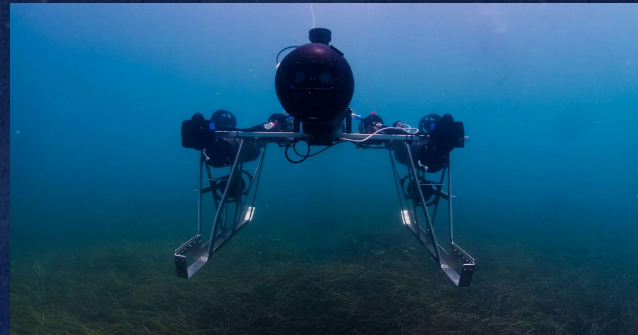
Working hours





Closing the gap

We're working build systems that restore at ecosystem scales.





How we're doing it

We've built a Lego-style system that lets us customize for any environment

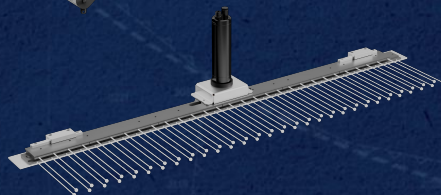


Our universal interface lets us add any custom or off-shelf payload equipment

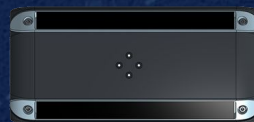
Seed planters



Seed collectors



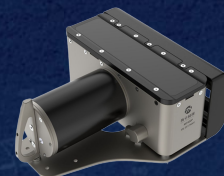
Sonars



Sondes



Multibeam





Our mission in Virginia (2025-2026)

Develop autonomous systems that accelerate every stage of eelgrass restoration.

Stage	Manual Capacity	Constraint	Ulysses Target
Seed Collection	45K seeds / hr	Cost, labor	45K seeds / hr
Seed Processing	30,000 seeds / hr	Hand sorting	150,000 seeds / hr
Seeding	2 ha / person / day	Precision, scale	5 ha / day
Monitoring	Seasonal	Cost, weather	Continuous

**Project
Partners:**





Seed Collection

First Trial: May 2025

Trial Goals:

- AUV-mounted shoot cutter
- Height actuator to adjust for canopy variation
- Capture net integrity

Next Improvements:

- AI models to detect flowering shoots to cut selectively
- More precise cutter adjustments
- Hubless thrusters to minimize entanglement





Seed Processing

First Trial: May - July 2025

Goals

- Automated stirring and waste material removal
- Remote operation & monitoring

Next Improvements:

- Upgraded rust-proof structure
- Improved waste removal
- Stir paddles with brushes or flaps to contact the bottom
- Intuitive controls





Seeding

First Trial: October 2025

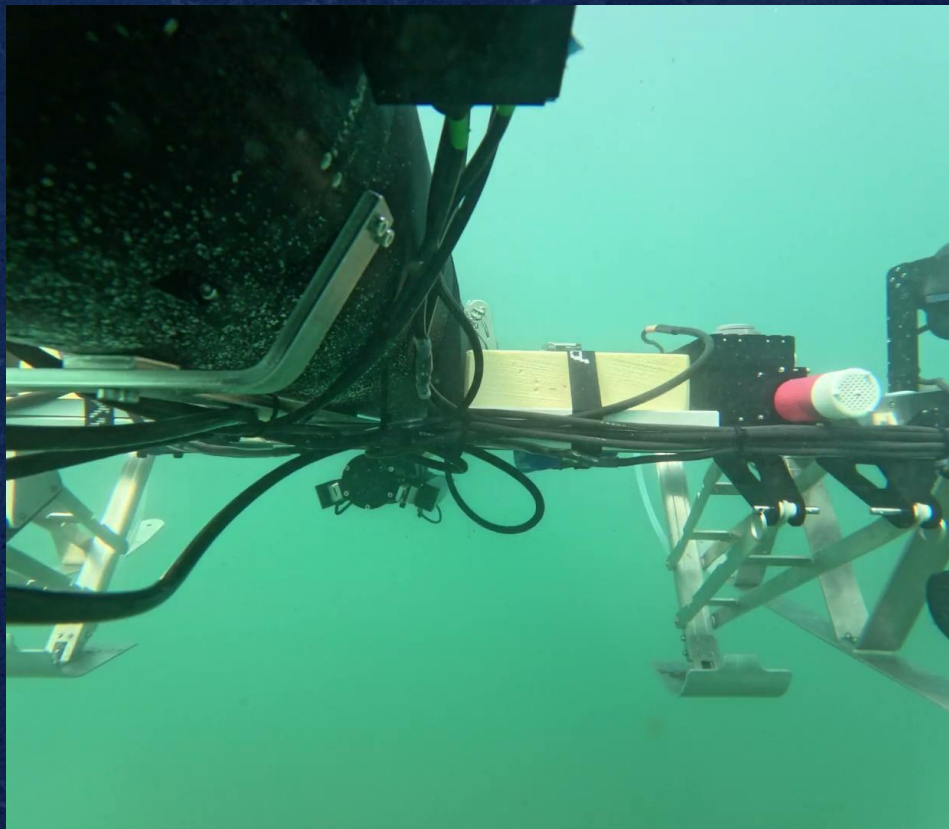
Seeds: 80,000

Plot Size: 1 acre

Time to Complete: 1 full working day

Next Improvements:

- Longer, autonomous runs
- Higher seed capacity per dive
- Fully automated planting patterns





Monitoring

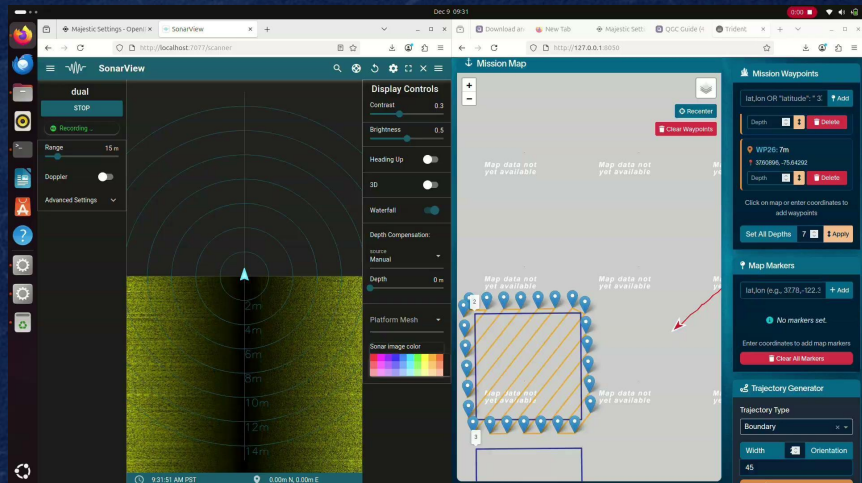
First Trial: December 2025 (in progress)

What we're testing:

- Autonomous navigation in low-visibility conditions
- Sidescan sonar for seedling detection
- AUV seeding success rates

What we're seeing:

- Navigation successful in poor environments
- Sidescan operating well
- Seedling verification ongoing





Lessons learned and next steps

2026 Plans:

- Scale collecting and seeding to multiple hectares / day.
- Operate over a much larger time frame (February → April).



Stage	2025 Results	2026 Improvements
Collection	Cutter payload successful first test	AI targeting, hubless thrusters
Processing	Separation mechanism functional	Rust-proofing, waste removal
Seeding	80k seeds / 1 acre / 1 full day	Autonomous paths, larger hopper
Monitoring	Nav + sidescan functional	More seedling detection validation



Scaling up our efforts

SAV conditions are generally improving, but need assistance.

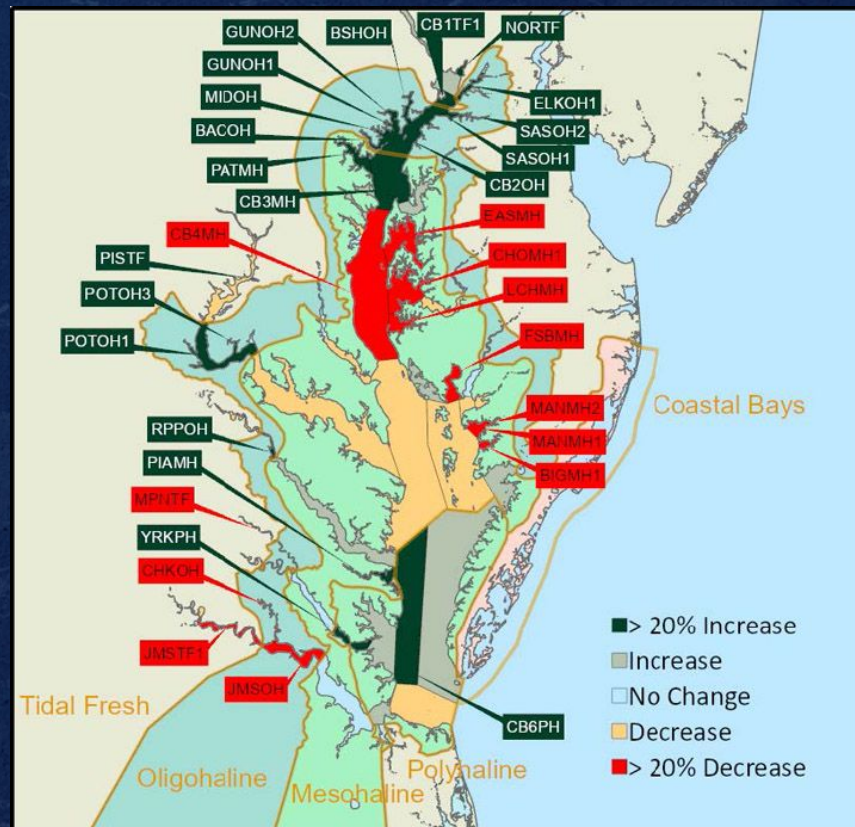
What Virginia proved:

- Collection, planting, and monitoring at field scale
- Operation in conditions that slow manual methods
- Acre-scale seeding with first-generation systems

What we need to scale:

- More field time in real conditions
- Sites with restoration need and scientific support
- Funding to deploy full-scale operations

We're aiming to restore 500 acres of SAV - We can't do it alone.





Thank you.



Nate L'Esperance
Project Development Lead
nate@ulysses.eco