Planting Process

Above: a volunteer wedges a plant into the riprap.

The grasses in the coconut fiber pots are planted by wedging them in the voids of the rock.

1. The grasses are grown out for 4-6 weeks in 3” coconut fiber coir pots by the nursery.

1. Volunteers plant the grasses by wedging them in the voids of the riprap. The coconut fiber pots hold soil in for the plants while their roots can get established in the rock.
2. After 1-2 growing seasons the plant roots grow to an extent that the grass is fully established in the rock. The coconut fiber pot biodegrades and the established grass traps sediment and begins building its own soil.
3. The grasses spread through rhizome and further colonize the rock.

Plants

Spartina alterniflora

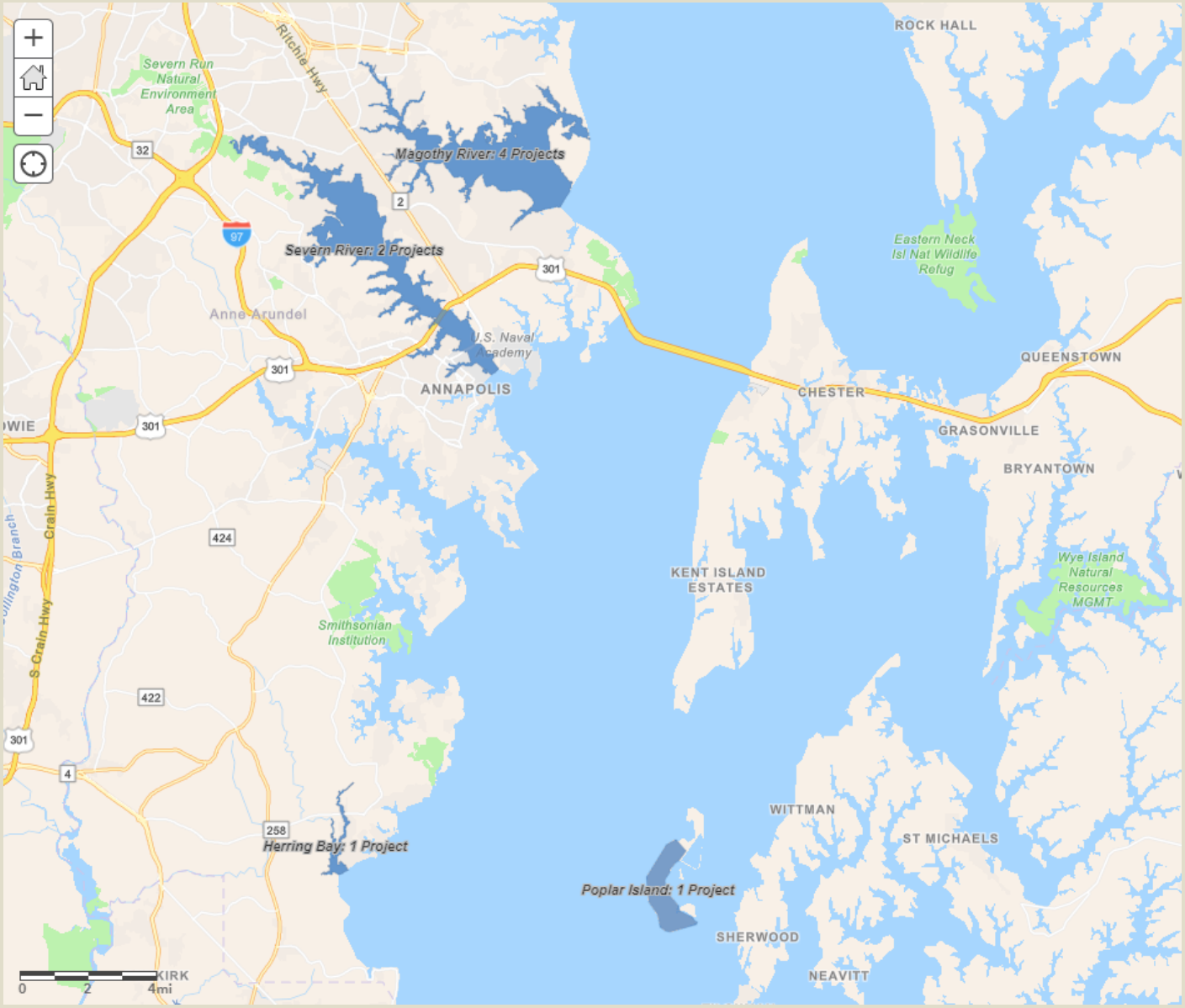
Spartina patens

Panicum virgatum

Solidago sempervirens

Volunteers Complete Plantings

Project Spotlights

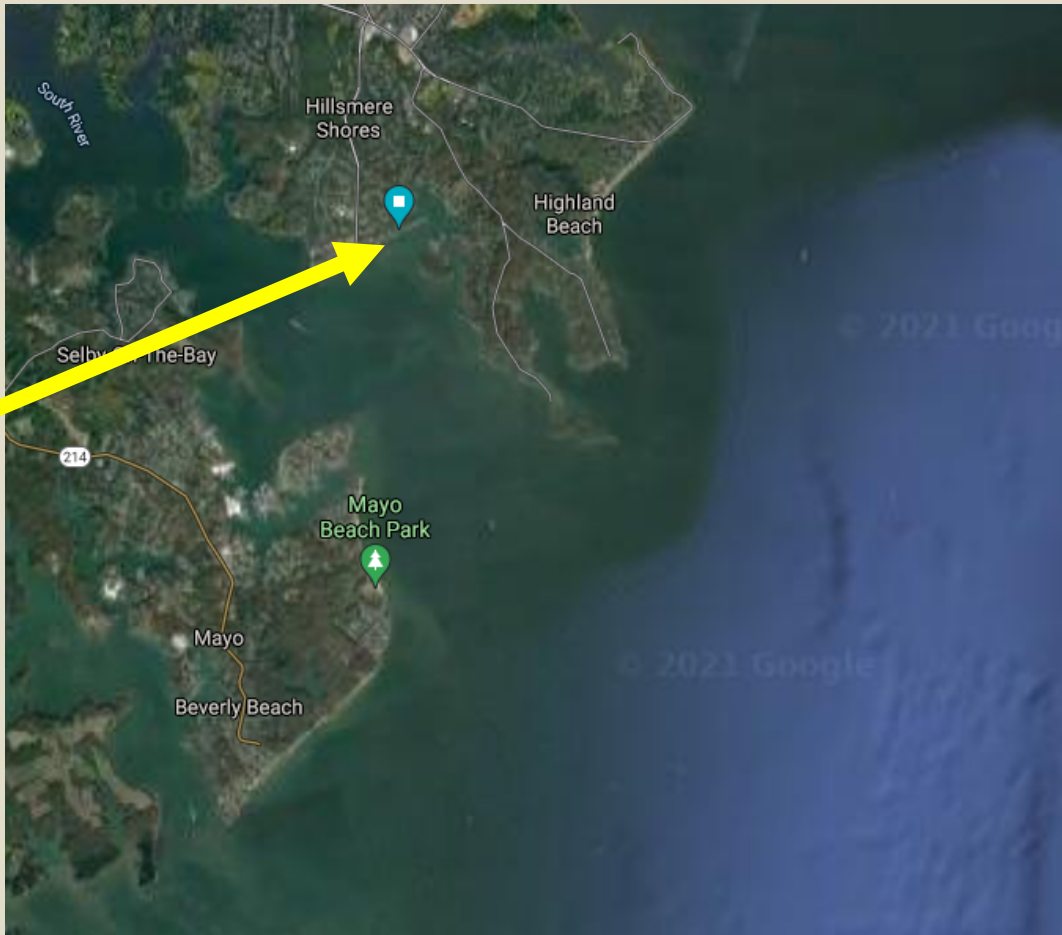


Hillsmere Community Marina planting (2020)

- Marina at the mouth of the South River in Anne Arundel County, MD
- Planting location was a rock groin
- Direct planting method (plants in coir pots) in larger rock size (10-14” avg)
- After a year, most plants gone (~10% remain)

Hillsmere Community Marina planting

- Possible contributors to failure:
  - Too much energy at the site preventing vegetation from staying secure in the rock
  - Some may have been planted too high due to volunteer involvement
  - Planting occurred in late August due to COVID, not enough time to grow and establish in the rock



Poplar Island planting (2019)

- Protected cove within Cell C
- Direct planting method in larger rock
- All S. alterniflora, planted mid-August
- Good survival after two years, some plants may have floated off due to large rock size

2013- Chesapeake Conservation Corp Capstone Project

Goal: To improve the ecology of rip-rap shorelines:

- Improve aquatic and terrestrial habitat
- Reduce wave energy
- Trap sediment from littoral drift and from upland sources
- Uptake nitrogen from groundwater seep and from adjacent uplands
- Provide a seed source for adjacent shorelines
- Reduce the increased water temperature caused by rocks

Other Benefits

- Improve aesthetics
- Provide landowners another way to help their local waterway
- Increase volunteer engagement

Ulmstead Community Marina **(located off White Swan Drive)**

Conditions:

- Wave energy: Fetch of 1.3 miles to the NW. Significant boat wake.
- Nearshore water: Shallow bench off rock- not exposed at normal low tide
- Sediment: Very little sediment accretion in rock. Most adjacent shoreline has bulkheads. Upland area gentle slope, likely provides some sediment.
- Aspect and Shade: NW facing. One small tree, otherwise full sun.
- Existing plants: S. patens, high tide bush and groundsel tree, marsh hibiscus.

- **Planted in 2013. No sand added**


2013 post planting


2021


2018

Ulmstead Community Marina

Results: Good establishment of S. patens. S. alterniflora mostly failed except for one cluster. Several other plants colonized area adding to the diversity.

Some of the S. alterniflora may have been planted below mid–tide. Boat wake could have been a factor for low survival of S. alterniflora too.

Magothy River Site - 321 South Drive, Severna Park

Existing Conditions:

- Wave Energy: Quite cove, max fetch of 0.3 miles to the ESE. No significant boat wake- 6 mph.
- Nearshore water: Shallow bench off rock- exposed at normal low tide
- Sediment: Very little sediment accretion in rock. Small natural marsh is adjacent. All other adjacent shoreline has bulkheads or rip-rap. Upland area – forested and steep slope. Likely provides some sediment.
- Aspect and Shade: ESE facing. Shading from trees- partial sun
- Existing plants: Nothing in rock. English ivy was removed prior to planting.
- **Planted in 2015. Sand added**

Results: Good growth of S. patens. Seaside goldenrod growing well. S. alterniflora mostly failed except for 3-4 sprigs that are still alive. Several other plants colonized area adding to the diversity.

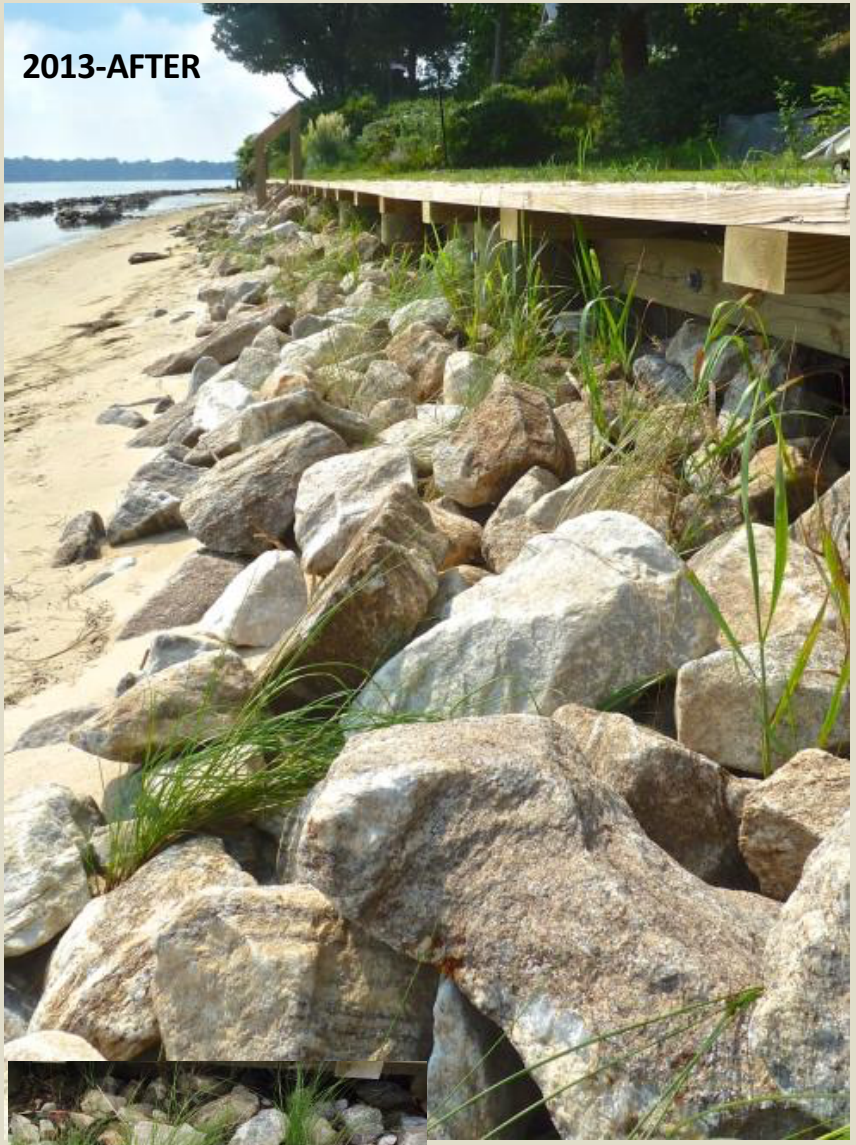
The sand in the intertidal area washed out, taking plants with it. The large size of the rock limited the planting areas.

Round Bay Community Beach: (Severn River Rd.)

Existing Conditions:

- Unique feature: A sill was installed in part of the project area as part of previous project.
- Wave energy: Fetch of 2miles to the SSW. Significant boat wake
- Nearshore water: Some of area has exposed beach off the rock, other areas have gently sloping shallow water that is not exposed at normal low tide. Lots of SAV in nearshore waters.
- Sediment: Less then 1” of sediment accreted in rock. The swimming beach is to the east, otherwise most adjacent areas have bulkheads or revetment Upland area varies, likely provides some sediment
- Aspect and Shade: South facing. Full sun.
- Existing plants: No plants were found prior to project
- **Planted in 2013. No sand added**

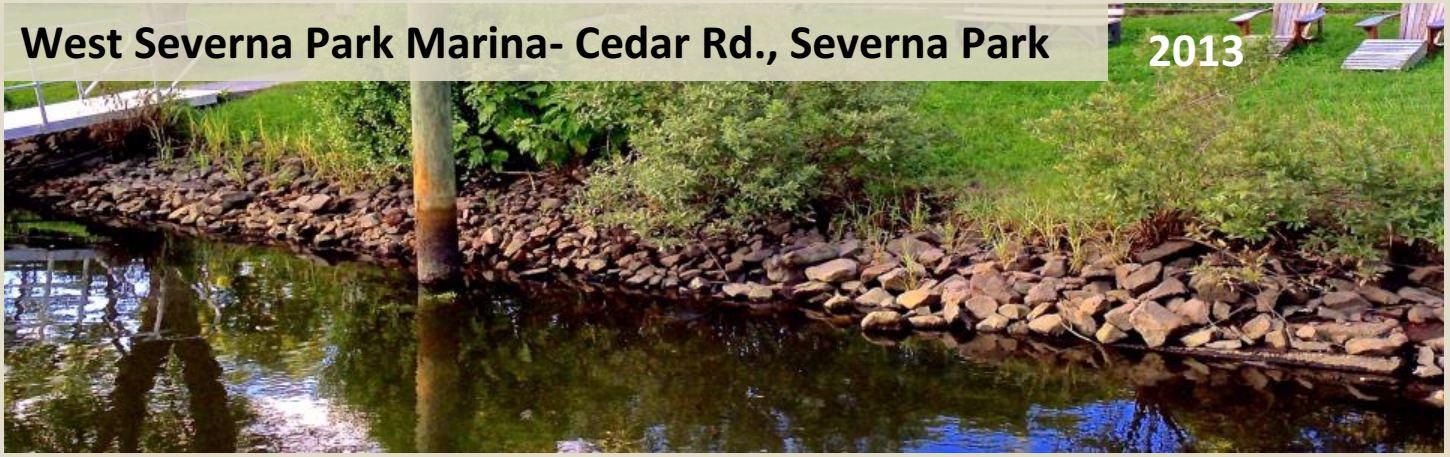
Round Bay Community Beach



Round Bay Community Beach

Results: Excellent growth of all plants in main area. Slower growth moving west but plants spread dramatically by 2020.

West Severna Park Marina- Cedar Rd., Severna Park

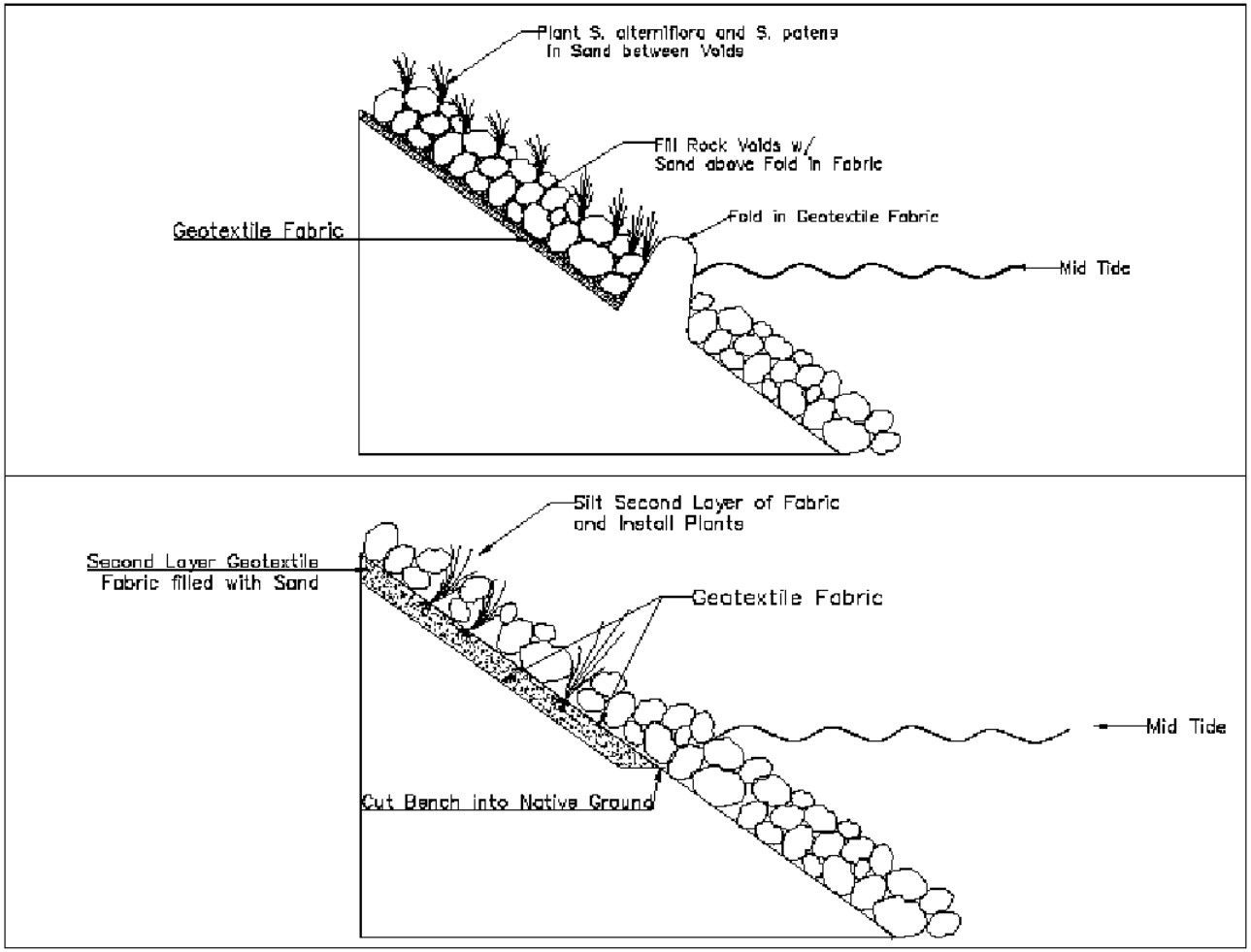


Existing Conditions

- Wave energy: Fetch of 0.3 miles to the SSW. Protected Cove, no boat wake
- Nearshore water: Bottom is not exposed at normal low tide
- Sediment: Less then 1” of silty sediment accretion in rock. Upland area varies, likely provides some sediment
- Aspect and Shade: South facing. Full sun.
- Existing plants: High tide bush, Hibiscus
- **Planted in 2013. No sand added**

Results:- Good growth of all plants.

New Revetments



Lessons Learned

- Establishing marsh grasses within the spaces between rocks can be done.
- *Spartina patens* and *S. alterniflora* will grow hydroponically if placed in the correct intertidal zone- no soil is needed.
- This can be accomplished in areas with 0-2 miles (maybe more) of fetch and significant boat wake.
- S. patens is a very tough plant and seemed to thrive more than the S. alterniflora
- Using coir pots with larger root mass vs. plugs is beneficial.
- It is difficult to get sand to settle and pack in the spaces between rocks.
- The sand fill that we placed at all three sites washed out with the tides carrying plants with it.
- Rip-rap is not easy to plant. These are sloped areas with irregular rock. Rocks need to be moved and plants wedged between rocks.
- Large rip-rap that cannot be moved will need special considerations and more experimentation
- Take care in determining the correct intertidal zone for the species being planted. The coloration on the rocks will help define the zones. Black rocks seem to indicate the mid tide to the high tide zone.
- Look for nearby biological benchmarks or reference site.
- Be prepared for reinforcement plantings in subsequent years
- Be Patient!

Green Riprap Site Conditions		
Variables	Methods	Comments learned from Pilot Projects
Location	GPS coordinates	
Aspect		Does not matter
Sun Exposure		Full sun best
Avg. Fetch (nm)	# of vectors, drawn on GIS, averaged	2 miles or less is worth considering
Longest Fetch	vector drawn on GIS	
Boat Wake (mph)		No wake zone better. Sites with boat wake can work too
Revetment Slope		3:1 or less is best
Nearshore Slope		Gradual nearshore slope is best
Size of rock		Smaller rock is better
Sediment Source	littoral drift, upland slope	Important to speed up the spread of plants
Nearby Natural Marsh	NWI data	Can be helpful for seed source
		The best sites seem to have exposed bottom

		can work too
Revetment Slope		3:1 or less is best
Nearshore Slope		Gradual nearshore slope is best
Size of rock		Smaller rock is better
Sediment Source	littoral drift, upland slope	Important to speed up the spread of plants
Nearby Natural Marsh	NWI data	Can be helpful for seed source
Exposed Mud/Sand Flat		The best sites seem to have exposed bottom at low tide – maybe this reduces wave energy?
Soil Depth (Low-Mid)		Any soil or sediment in the rock voids is good
Soil Depth (Mid-High)		
Pecent Cover (Low-Mid)		
Percent Cover (Mid-High)		
Plant Diversity	# species present	Existing plants provide a great biological benchmark in addition to a clue to the expected outcome