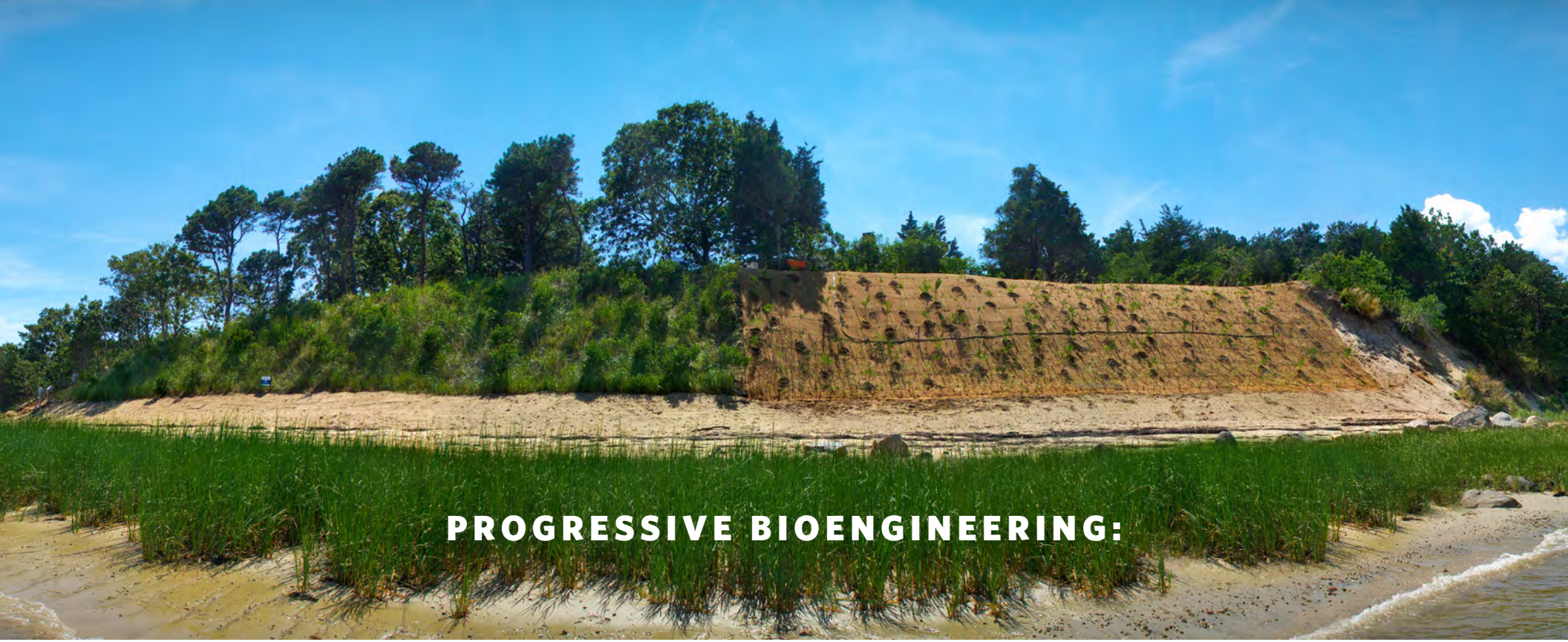
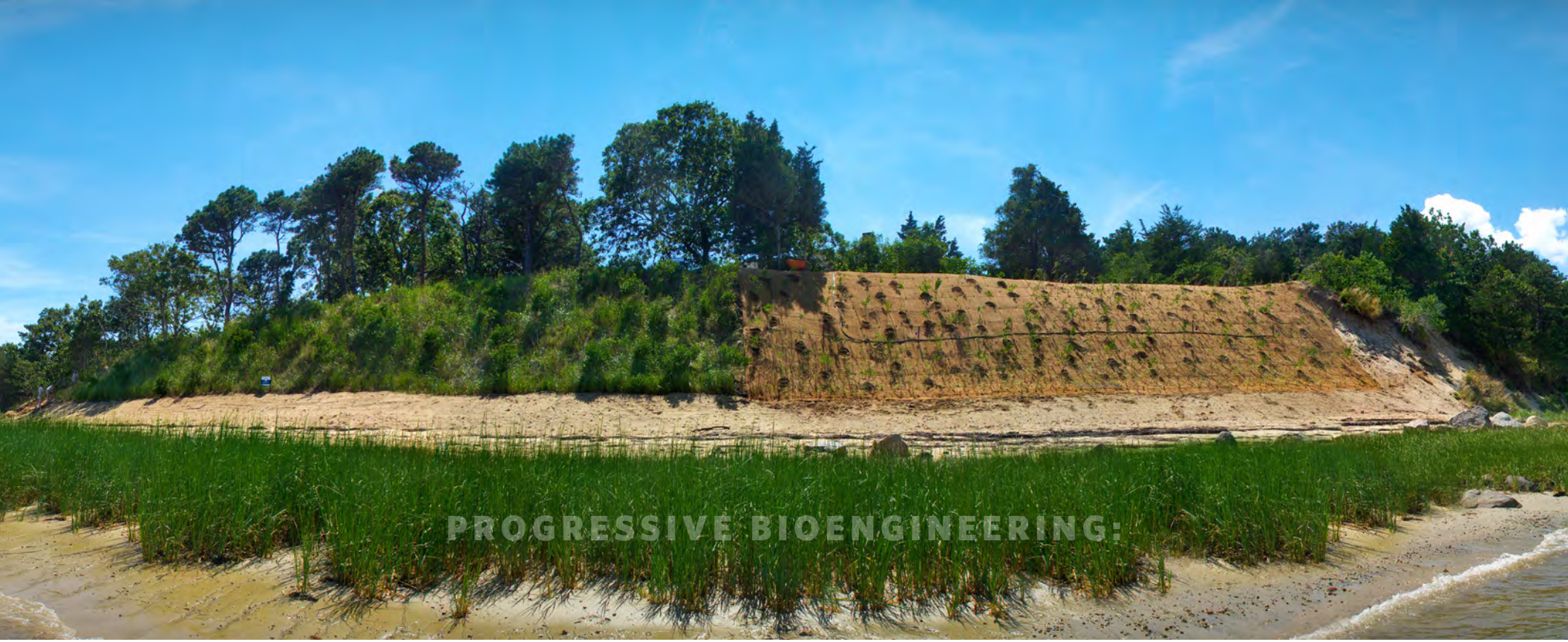


# PROGRESSIVE BIOENGINEERING:

## The Latest Developments in Non-structural Alternatives for Shoreline Stabilization

WILKINSON
ECOLOGICAL DESIGN




The Latest Developments in Non-structural Alternatives for Shoreline Stabilization

**Based on SITE SPECIFIC Criteria**

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Understanding if a beach has a
BASE ELEVATION.

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Understanding if a beach has a BASE ELEVATION.

Understanding the function a FRINGE MARSH plays.

## Based on SITE SPECIFIC Criteria

Understanding if a beach has a BASE ELEVATION.

Understanding the function a FRINGE MARSH plays.

Understanding near shore characteristics such as FETCH, WATER DEPTHS, SAND BARS, and location within a given LITTORAL CELL.

# BIOENGINEERING STRATEGIES
## Importance of Fringe Marshes in Coastal Stabilization

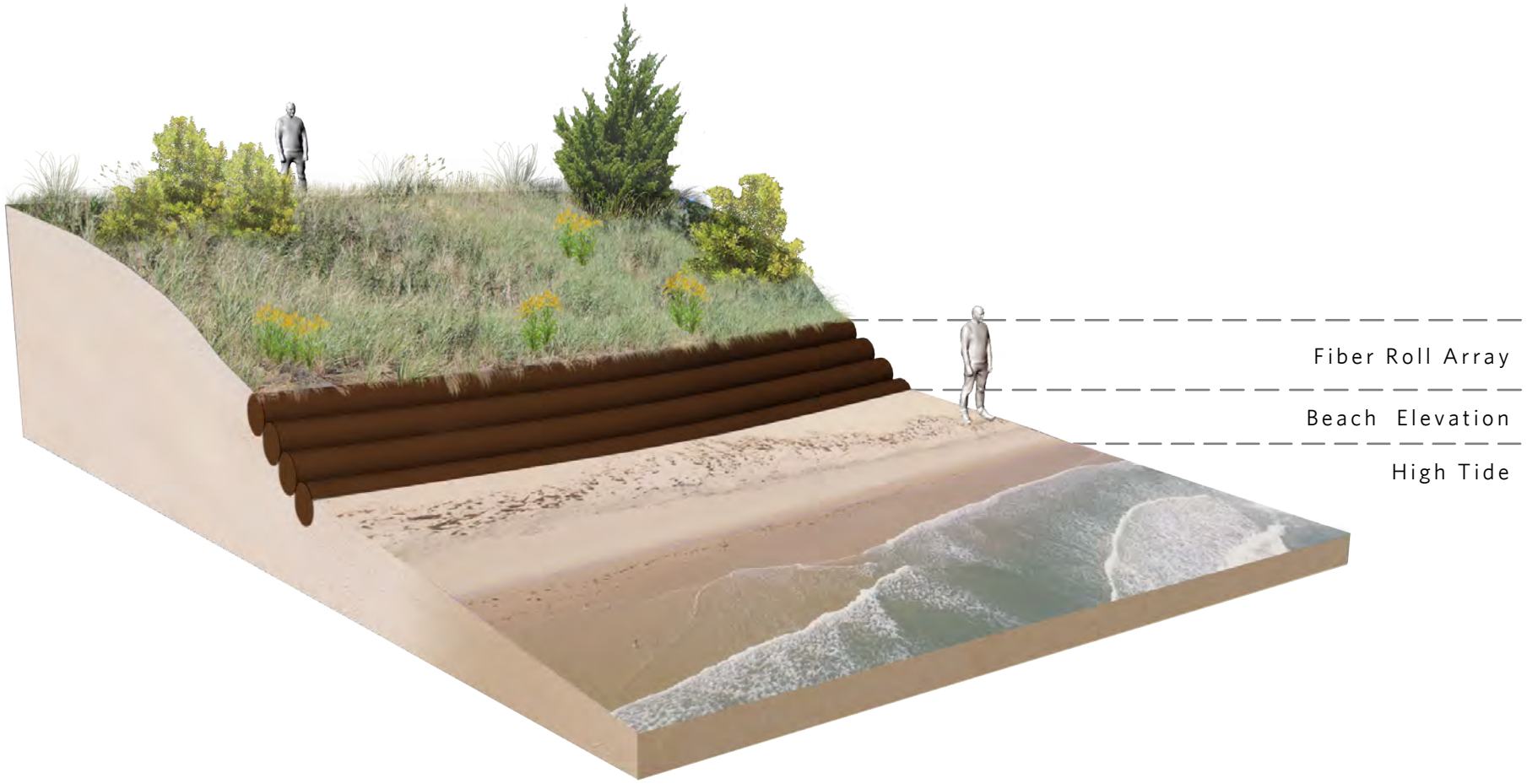
BIOENGINEERING STRATEGIES

# Importance of Fringe Marshes in Coastal Stabilization

- Woven coir-filled mats used as a growing medium.
- Pre-vegeated to establish prior before installation.

BIOENGINEERING STRATEGIES

# Importance of Fringe Marshes in Coastal Stabilization



BIOENGINEERING STRATEGIES

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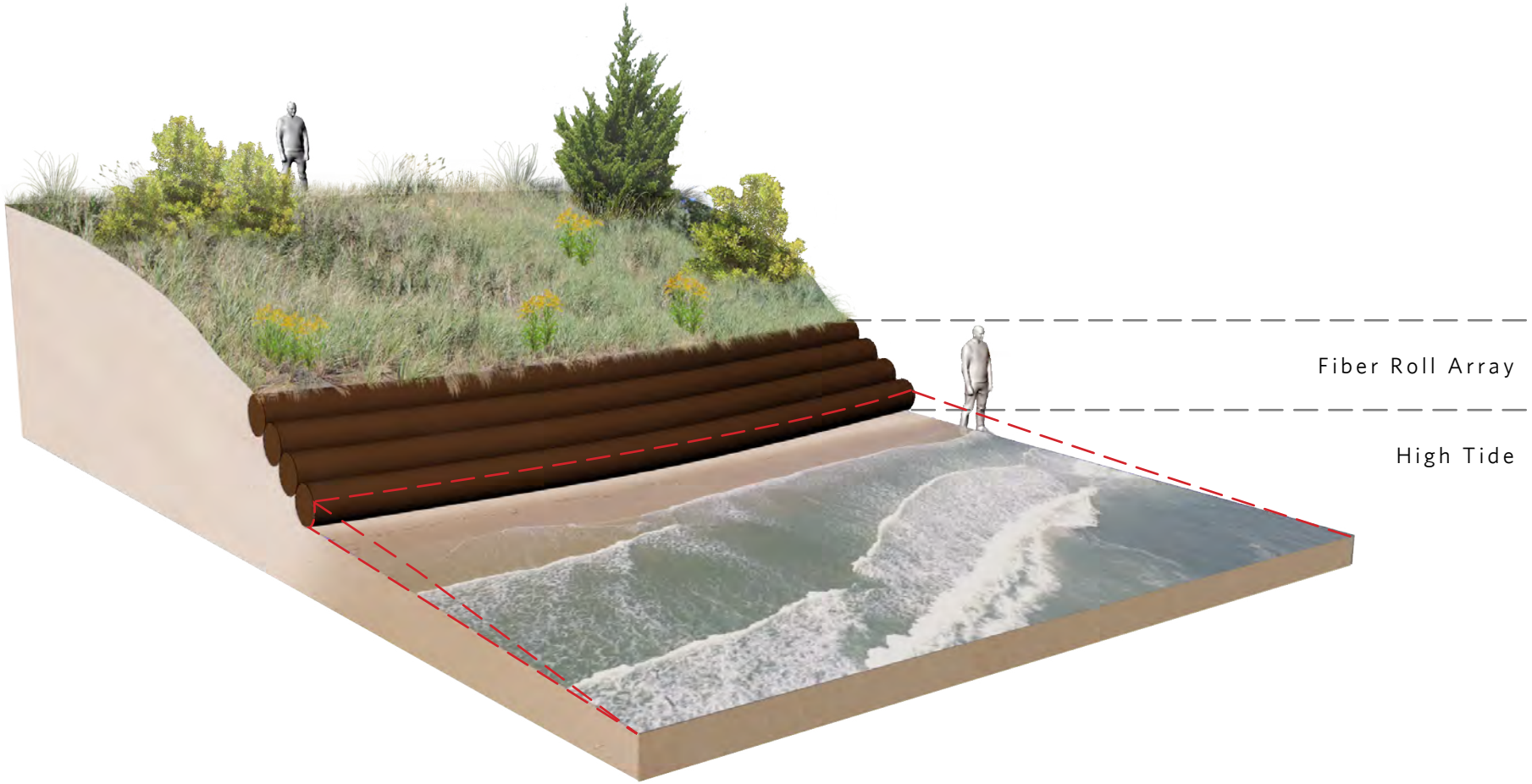

BIOENGINEERING STRATEGIES

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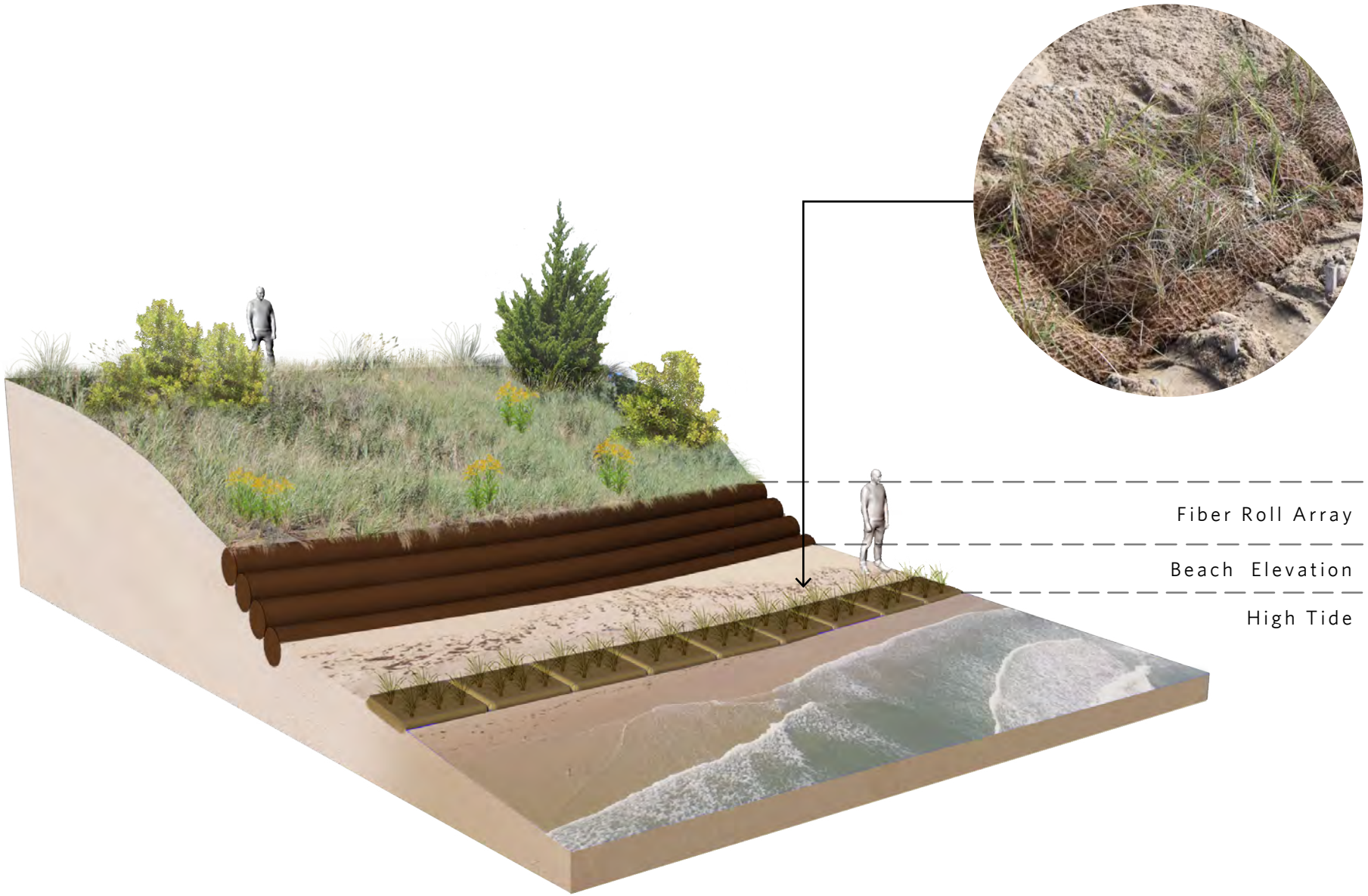
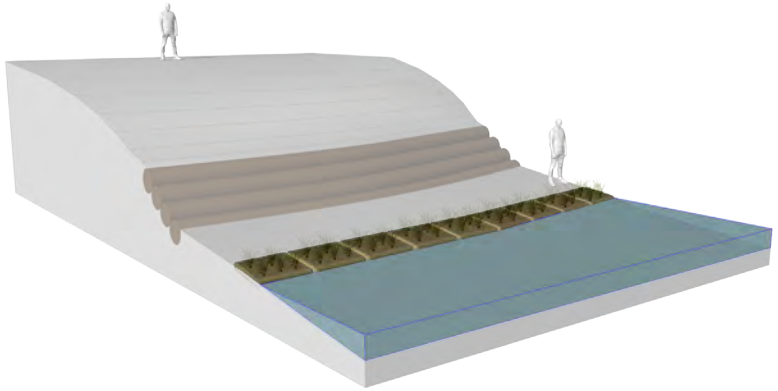


## Fringe Marshes



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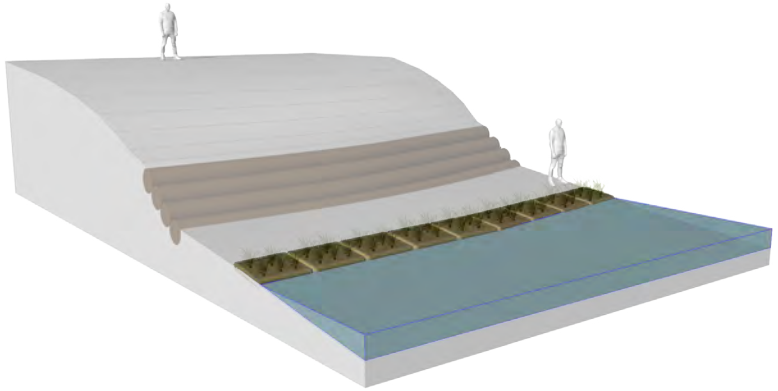
## Fringe Marshes



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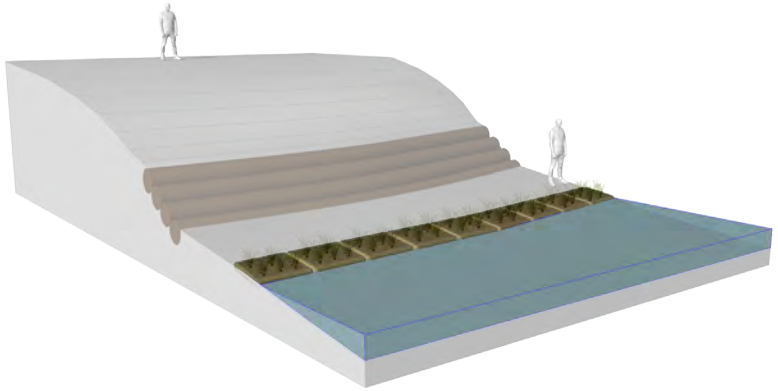
## Fringe Marshes





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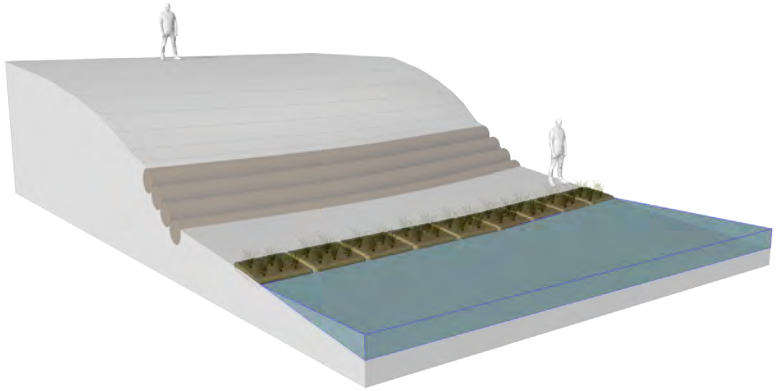



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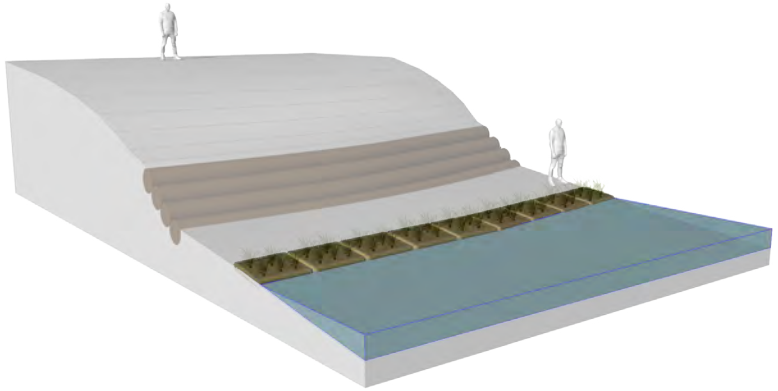

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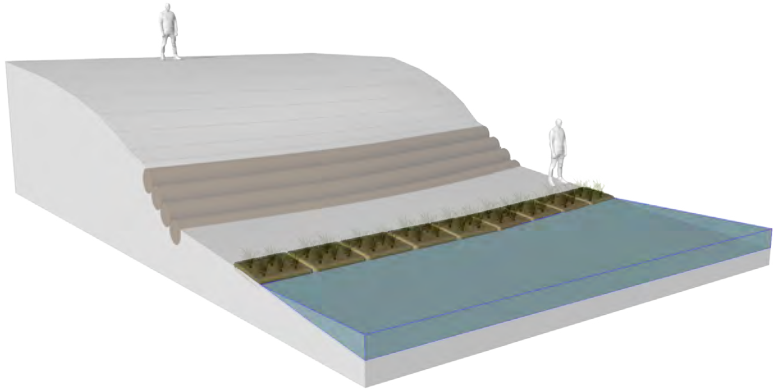
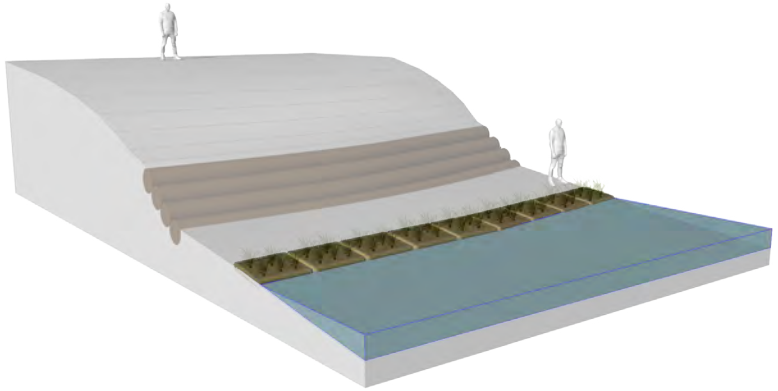
## Fringe Marshes



1 **2**

## Fringe Marshes



1 2 3

# MATERIALS

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**Coir Fiber Rolls**

Adds stability and protection to the toe of a bank and provides a window of opportunity to establish vegetation.

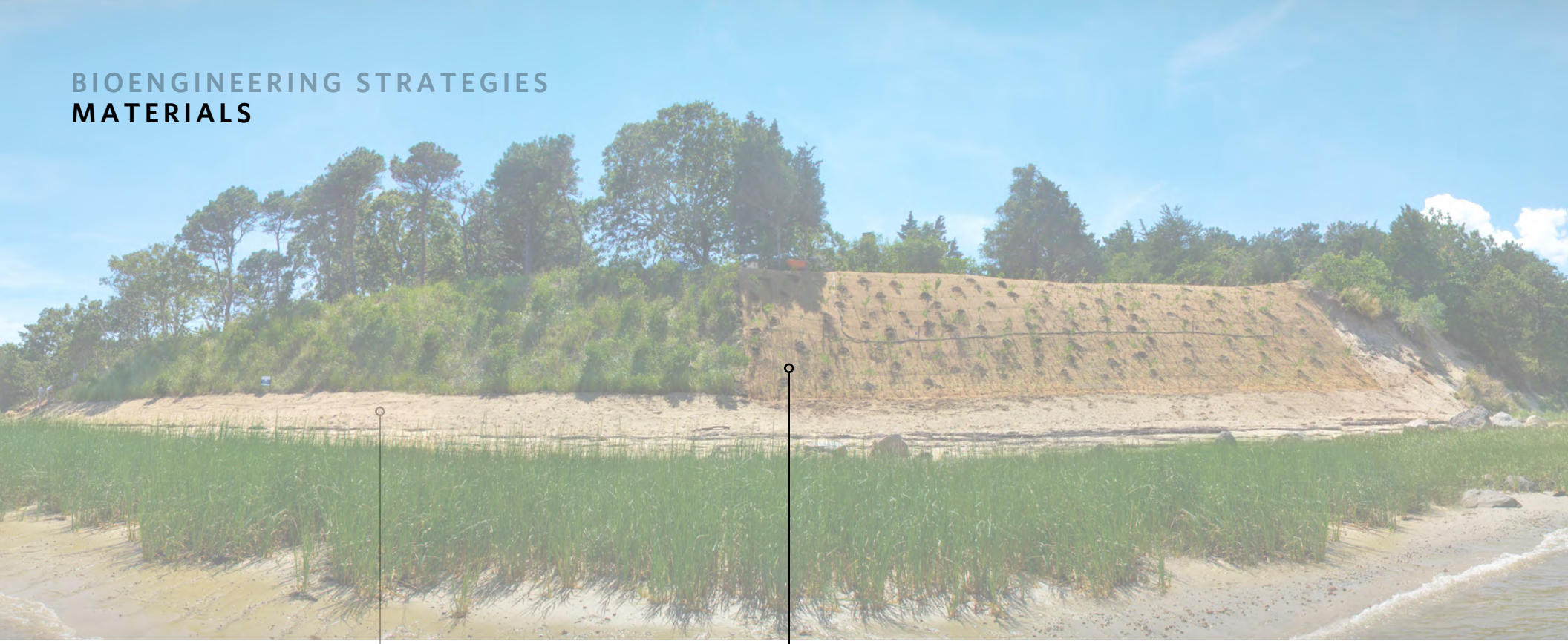
# MATERIALS

### Coir Fiber Rolls

Adds stability and protection to the toe of a bank and provides a window of opportunity to establish vegetation.

### Robust Anchoring System

## BIOENGINEERING STRATEGIES
# MATERIALS



### Coir Fiber Rolls

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### Robust Anchoring System

### Erosion Control Blanketing

blanketing of natural fibers are used to stabilize soils allowing time for NATIVE SALT TOLERANT PLANTS BECOME ESTABLISHED.

## BIOENGINEERING STRATEGIES
# MATERIALS

### Coir Fiber Rolls

Adds stability and protection to the toe of a bank and provides a window of opportunity to establish vegetation.

### Robust Anchoring System

### Erosion Control Blanketing

blanketing of natural fibers are used to stabilize soils allowing time for NATIVE SALT TOLERATE PLANTS BECOME ESTABLISHED.

- **Resists degradation from the marine environment.**
- **Absorbs some of the force of wave energy unlike many hard solutions that deflect the energy of wave action to surrounding areas.**
- **Materials life-expectancy to stabilize sediments matches the time required to ESTABLISH NATIVE PLANTS.**

## BIOENGINEERING STRATEGIES
# MATERIALS

NATIVE SHRUBS

NATIVE GRASSES

## BIOENGINEERING STRATEGIES
# MATERIALS

**Pre-vegetated Fiber Rolls**

**Native Shrubs**

**Native Grasses**

## BIOENGINEERING STRATEGIES
# MATERIALS

**Salt Marsh**

**Pre-vegetated Fiber Rolls**

**Native Shrubs**

**Native Grasses**

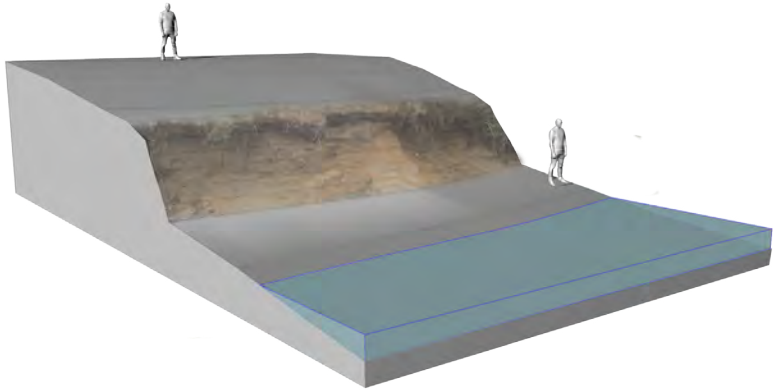
# MATERIALS

## Root Depths of Native Plant Species

BIOENGINEERING STRATEGIES

# INSTALLATION & CASE STUDIES

## Typical Eroding Bank

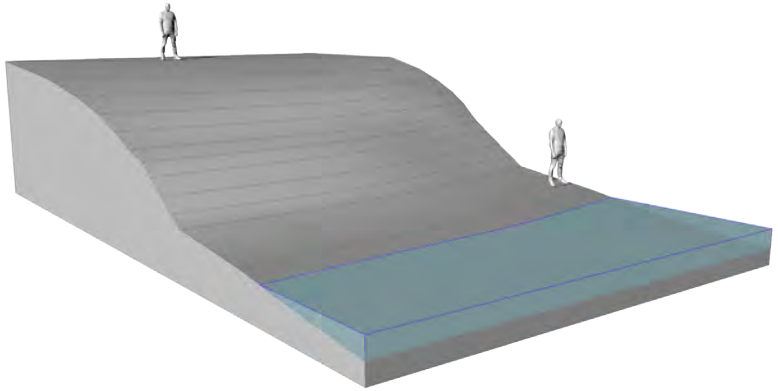


1

## Importance of Establishing a Stable Slope

- Utilizing a portion of the upper bank can create a more stable slope angle.
- Adds increased stability and storm damage prevention to the bank.
- Without this step, an investment in bioengeneering can be lost due to bank collapses.

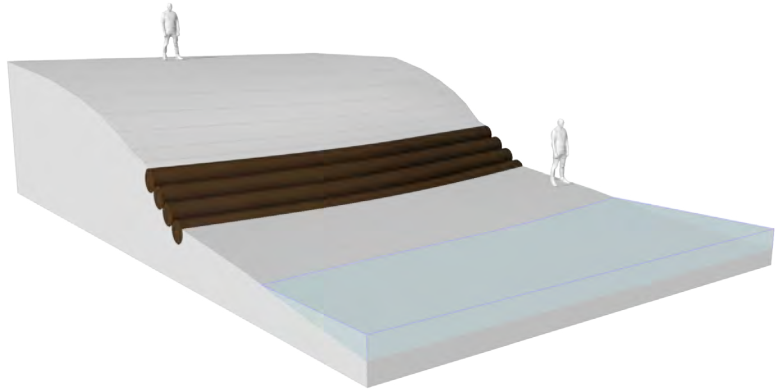
*(Storm Smart Properties Fact Sheet 4)*



1 **2**

## Stabilizing toe of bank - Fiber rolls

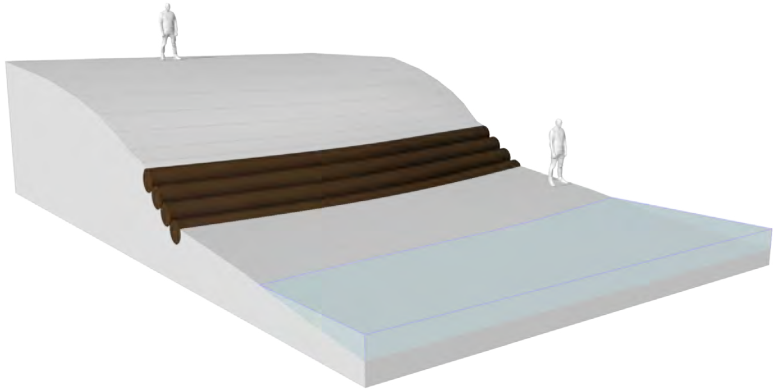
- Installation begins at the base of the array and proceeds up bank.
- Proper anchoring strategy to hold toe protection in place.
- Synthetic filter fabrics DO NOT ENHANCE success of a bioengineering project.





## Stabilizing toe of bank - Pre-vegetated fiber rolls

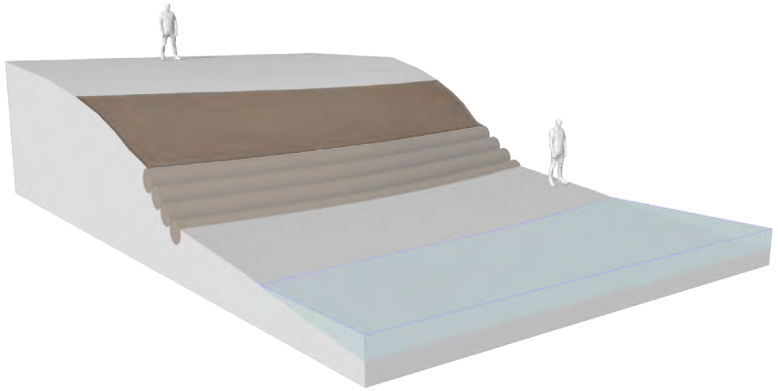
- Use of pre-vegetated fiber rolls along top of array.
- Added vegetation to the root matrix.
- Full season of plant growth prior to installation.





## Stabilizing soils above toe protection

- Native salt tolerant grasses are seeded into the bank prior to installation of erosion control blankets.
- Protect soils from erosion and helps to retain moisture to promote seed germination.

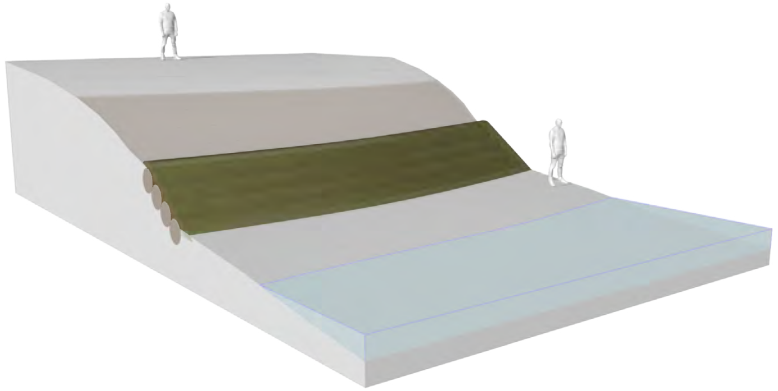




LITTLEBLUE STEM | SWITCH-GRASS | SIDEOATS GRAMA

## Sand cover for fiber rolls

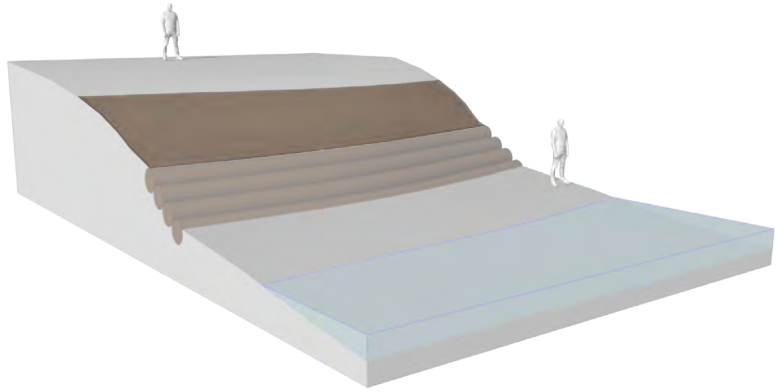
- Sand nourishment protects coir fiber rolls from photo-degredation “Sun Block”.
- Nourishment functions  as sediment source to the adjacent coastal resource areas.





## Native shrub species

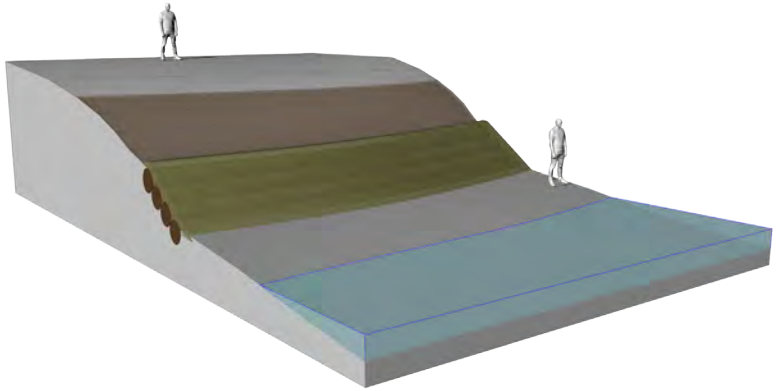
- Native beach plum and bayberry planted through erosion control blanketing.
- Temporary above ground irrigation for plant establishment.





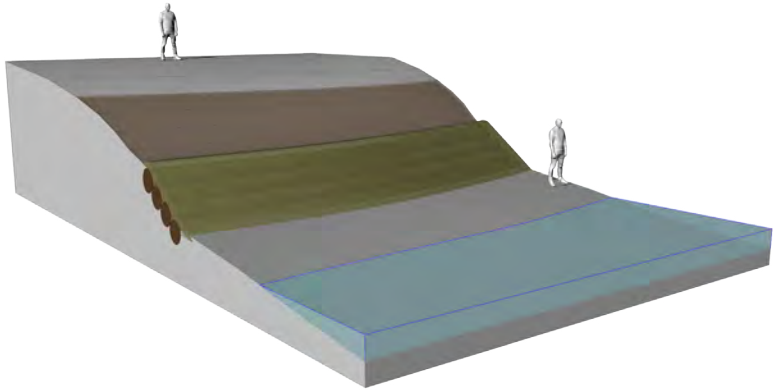
# INSTALLATION & CASE STUDIES

- Establishment of native vegetation after two seasons of growth.



1 2 3 4 5 6 **7**

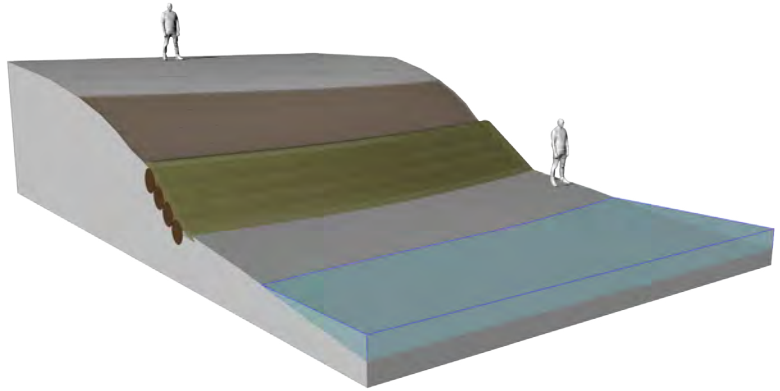
# Condition of fiber roll array following Hurricane Sandy 11/2012





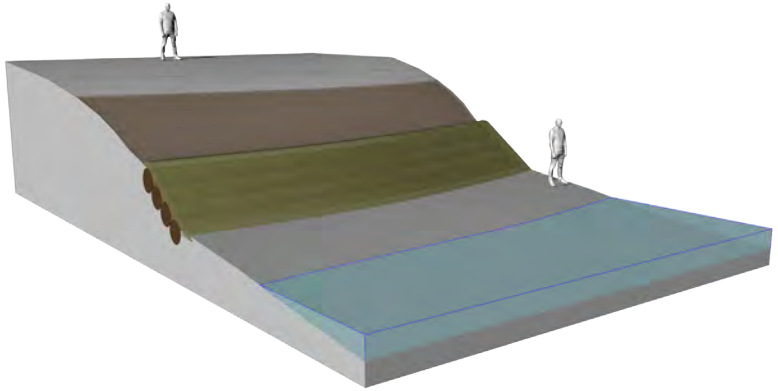
Waves reached above fiber roll array with no damage.

**Condition of fiber roll array following named storm Nemo 2/2013**





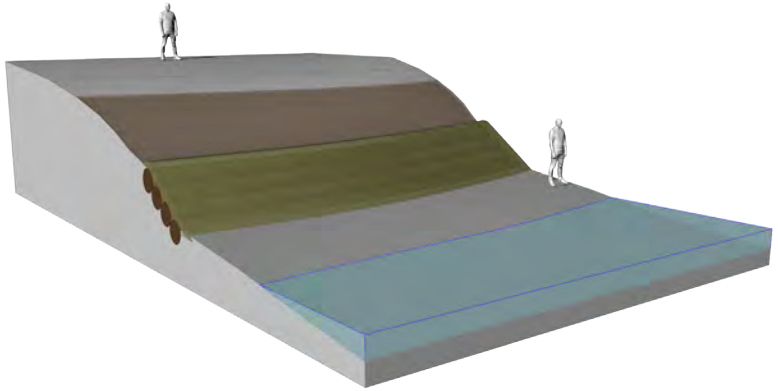
# Condition of fiber roll array following named storm Nemo 2/2013



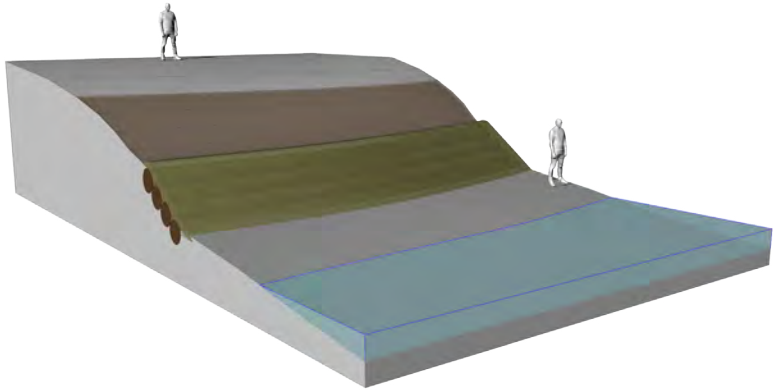


Waves reached above fiber roll array with no damage.

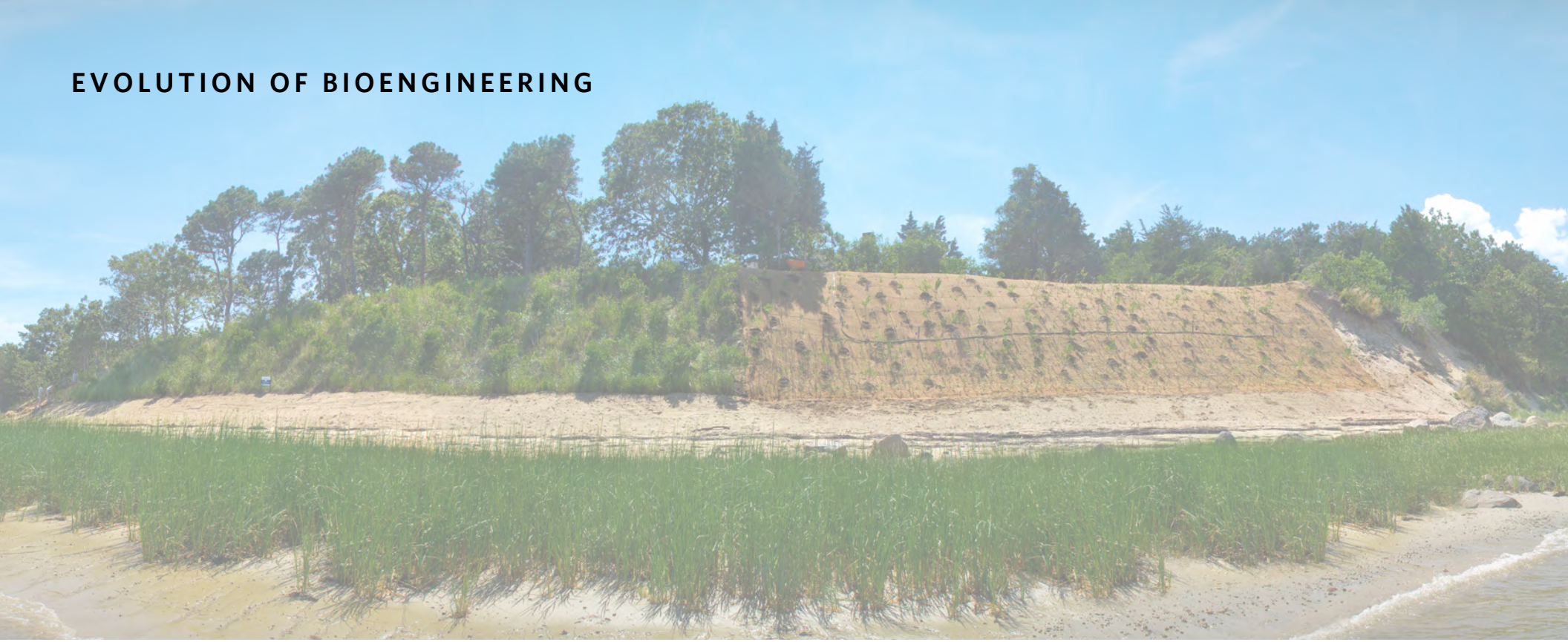
## Fiber roll array increased in length by 90′
## 6/2013



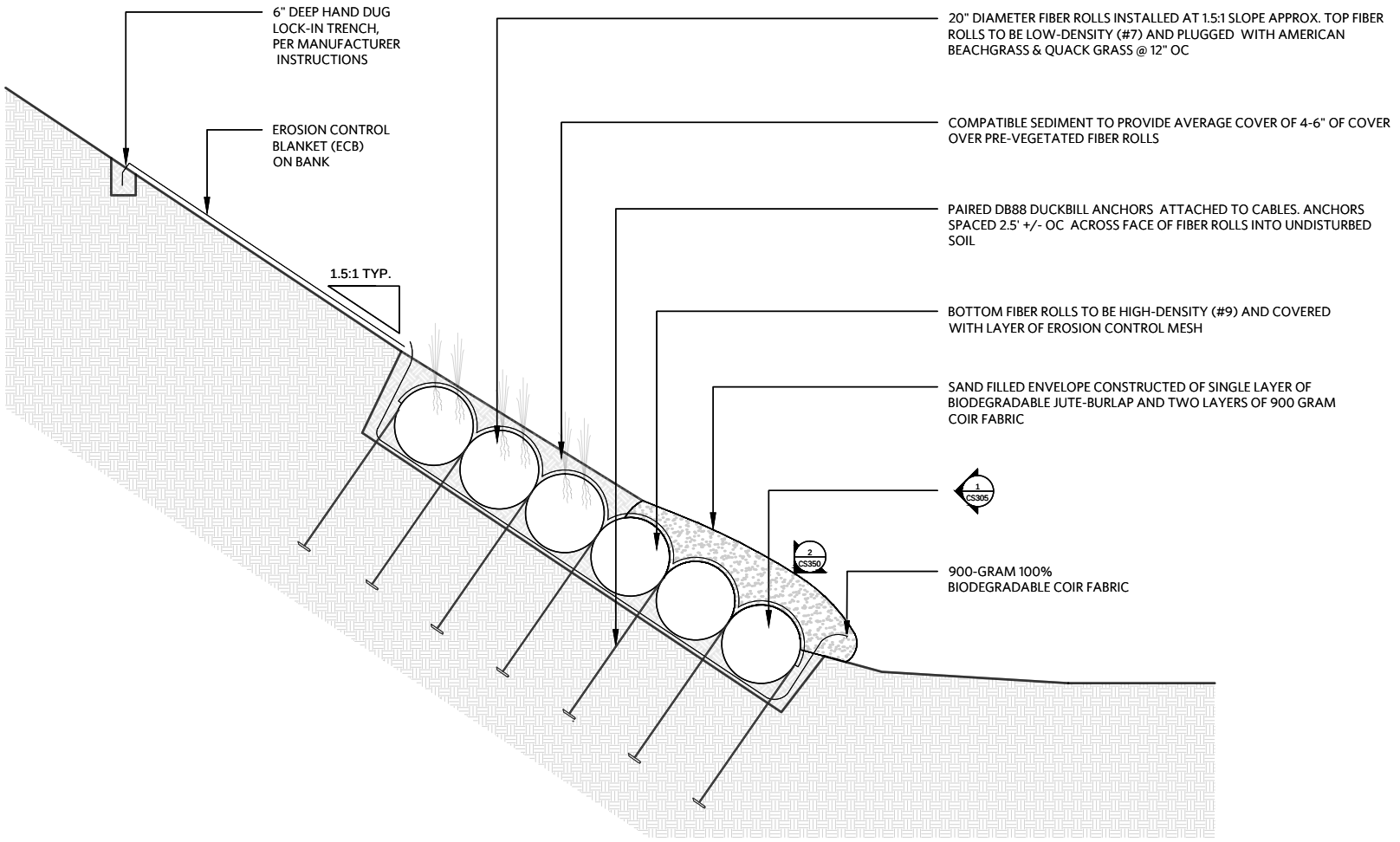
1 2 3 4 5 6 7 8 9 **10**



# EVOLUTION OF BIOENGINEERING



# Sand Envelopes

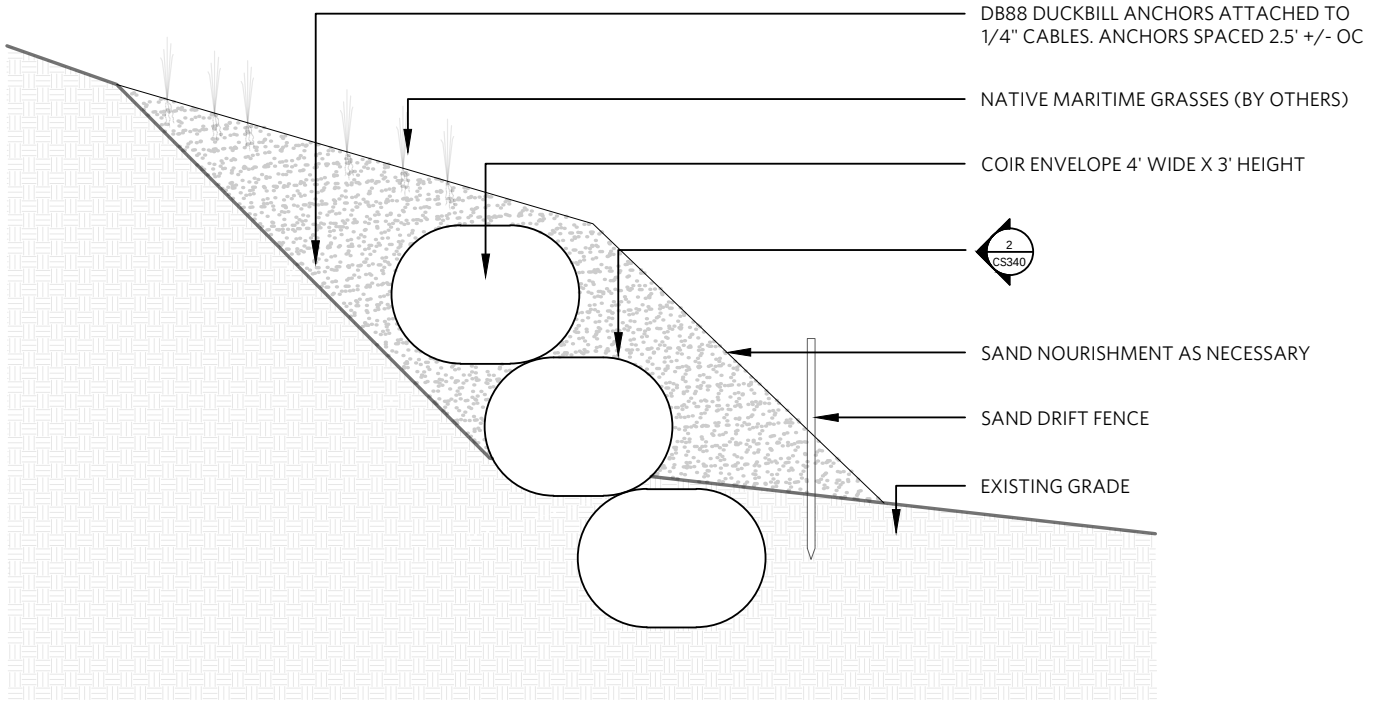



1 FIBER ROLL SECTION, TYPICAL

DETAIL PROVIDED BY WILKINSON ECOLOGICAL DESIGN, SPECIALISTS IN COASTAL STABILIZATION CONSTRUCTION

Scale: 3/8" = 1'

## Sand Envelopes




1 COIR ENVELOPE SECTION TYP.

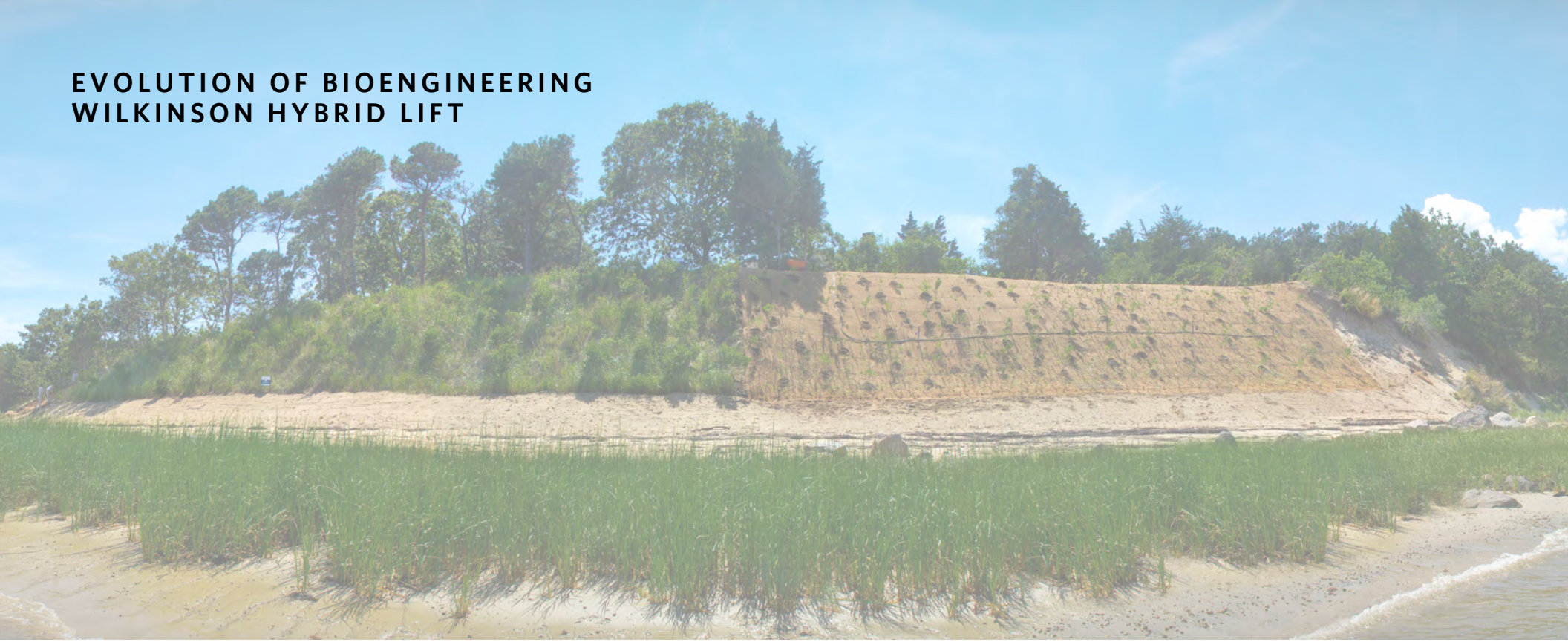
DETAIL PROVIDED BY WILKINSON ECOLOGICAL DESIGN, SPECIALISTS IN COASTAL STABILIZATION CONSTRUCTION

Scale: 1/4" = 1'

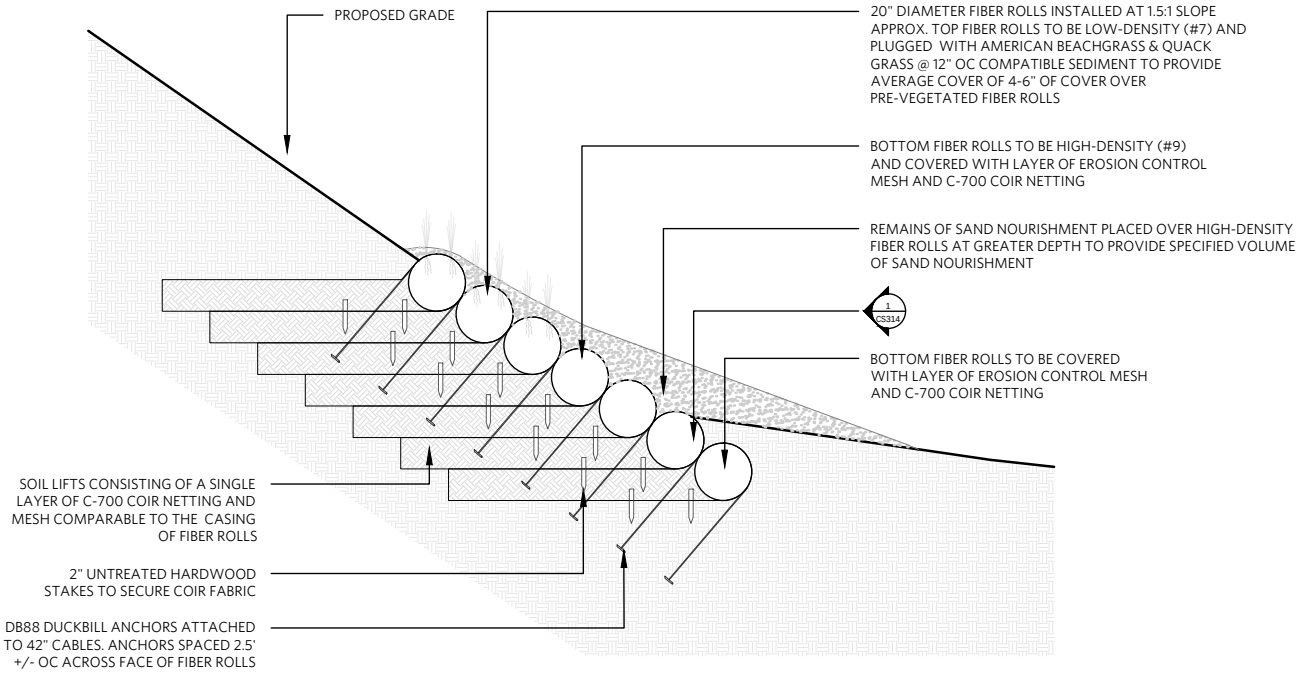
EVOLUTION OF BIOENGINEERING

## Sand Envelopes

# EVOLUTION OF BIOENGINEERING
# WILKINSON HYBRID LIFT



# EVOLUTION OF BIOENGINEERING
# WILKINSON HYBRID LIFT
*Patent Pending*




1 FIBER ROLL REINFORCED LIFT SECTION ,TYPICAL

DETAIL PROVIDED BY WILKINSON ECOLOGICAL DESIGN, SPECIALISTS IN COASTAL STABILIZATION CONSTRUCTION
PATENT PENDING

Scale: 1/4" = 1'

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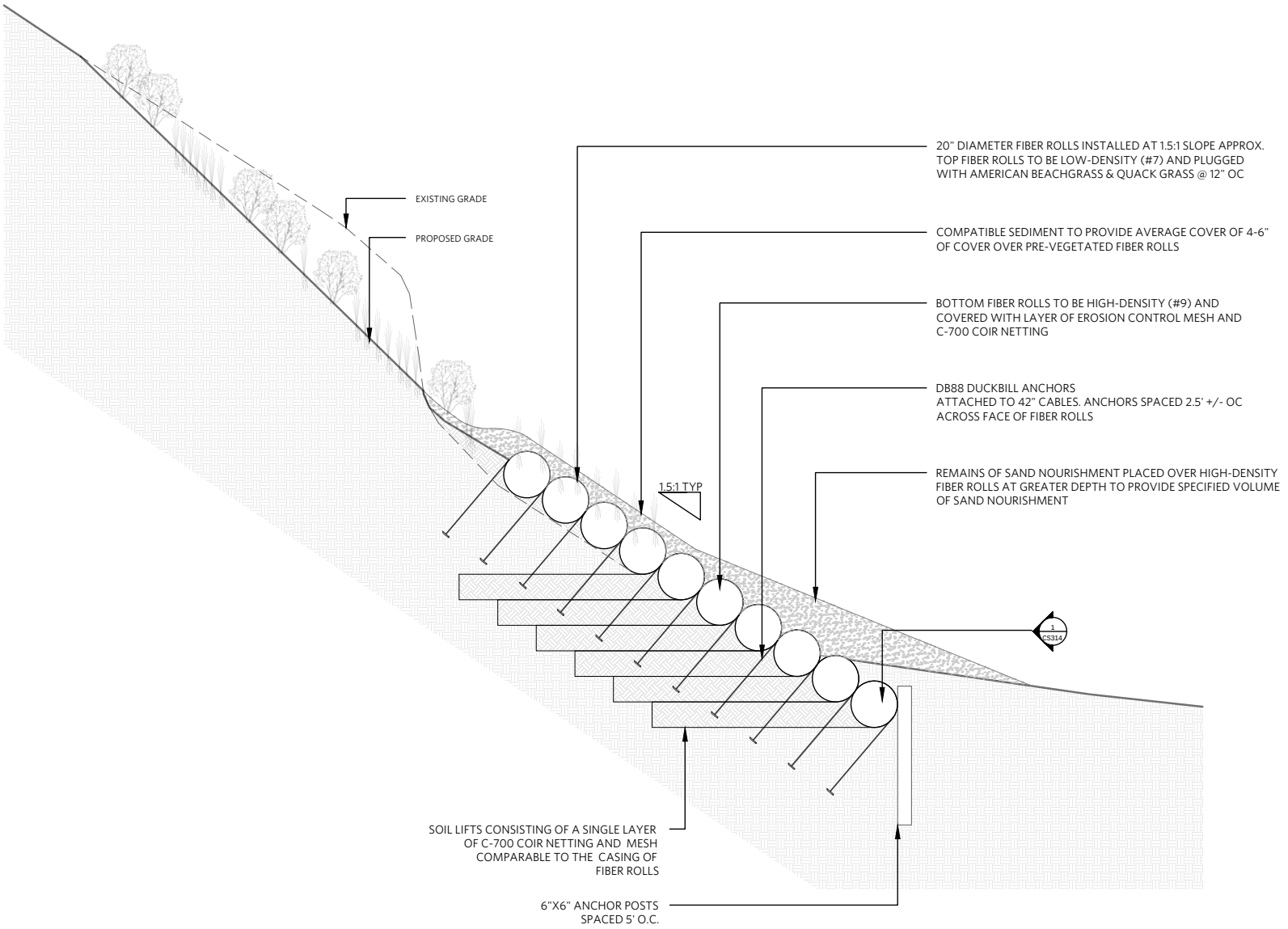


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PATENT PENDING

Scale: 1/4" = 1'

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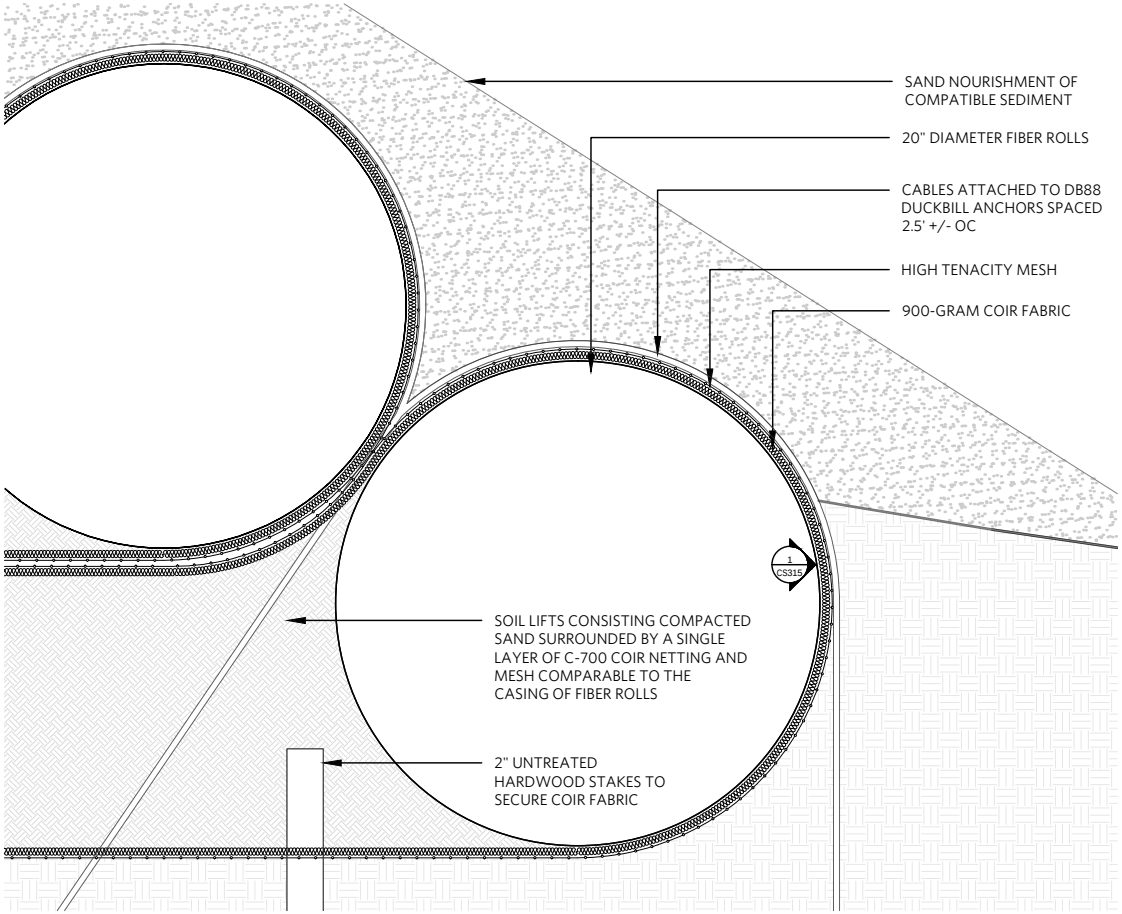
# WILKINSON HYBRID LIFT

*Patent Pending*

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## FIBER ROLL REINFORCED LIFT SECTION ,TYPICAL

DETAIL PROVIDED BY WILKINSON ECOLOGICAL DESIGN, SPECIALISTS IN COASTAL STABILIZATION CONSTRUCTION
PATENT PENDING

Scale: 2" = 1'

# EVOLUTION OF BIOENGINEERING
# WILKINSON HYBRID LIFT

*Patent Pending*

**1**

# EVOLUTION OF BIOENGINEERING
# WILKINSON HYBRID LIFT

*Patent Pending*

1 **2**

# EVOLUTION OF BIOENGINEERING
# WILKINSON HYBRID LIFT

*Patent Pending*

1 2 **3**

# EVOLUTION OF BIOENGINEERING
# WILKINSON HYBRID LIFT

*Patent Pending*

1 2 3 **4**

# EVOLUTION OF BIOENGINEERING
# WILKINSON HYBRID LIFT

*Patent Pending*

1 2 3 4 **5**

# EVOLUTION OF BIOENGINEERING
# WILKINSON HYBRID LIFT

*Patent Pending*

1 2 3 4 5 **6**

# EVOLUTION OF BIOENGINEERING
# WILKINSON HYBRID LIFT

*Patent Pending*

1 2 3 4 5 6 **7**

# EVOLUTION OF BIOENGINEERING
# WILKINSON HYBRID LIFT

*Patent Pending*

**1**

# EVOLUTION OF BIOENGINEERING
# WILKINSON HYBRID LIFT

*Patent Pending*

1 **2**

# EVOLUTION OF BIOENGINEERING
# WILKINSON HYBRID LIFT

*Patent Pending*

1 2 **3**

# EVOLUTION OF BIOENGINEERING
# WILKINSON HYBRID LIFT

*Patent Pending*

1 2 3 **4**

# EVOLUTION OF BIOENGINEERING
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*Patent Pending*

1 2 3 4 **5**

# EVOLUTION OF BIOENGINEERING
# WILKINSON HYBRID LIFT

*Patent Pending*

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