Designing Biodegradable Erosion & Sediment Control Solutions

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Agenda

- Overview of Erosion
- Biodegradable Erosion Control Solutions
- Biodegradable Sediment Control Solutions

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Erosion is the TRANSPORT of soils detached by water (or wind), and Sedimentation is the DEPOSITION of soils as a result of erosion.

Erosion and Sedimentation results in:

- On-Site Costs: loss of topsoil, rework, and clean-up
- Off-Site Costs: sediment migration from site, pollution of adjacent waterways
- Compliance Costs: NPDES violations and other regulatory penalties

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Erosion and Sedimentation is EXPENSIVE!

- Erosion-related pollutants cost the United States up to U.S. $13 billion annually
- United States spends over $1 billion removing sediment from harbors and waterways annually.
- EPA estimates that sediment deposition in reservoirs from storm water runoff costs up to $500 million annually.
- Annual water storage replacement costs from sediment range from $2 to $6 billion.
- Over $1.06 billion in NPDES penalties paid in 2021, the highest in four years

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Predicting Erosion with the Revised Universal Soil Loss Equation (RUSLE):
Avg. Annual Soil Loss = K x R x (LxS) x C x P

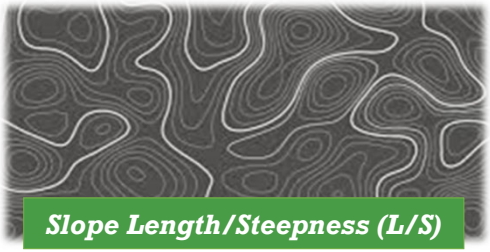
Soil Cover Factor (K)

What Affects the RATE of Erosion and Sedimentation?

- Soil Cover Erodibility Factor
- Intensity of the Rainfall/Storm Event
- Topography of the Project Site
- Amount/Type of Vegetative Cover on Site
- Construction Practices on Site

Conservation Practices (P)

Rainfall/Runoff Erosivity (R)



Slope Length/Steepness (L/S)

Vegetative Cover (C)

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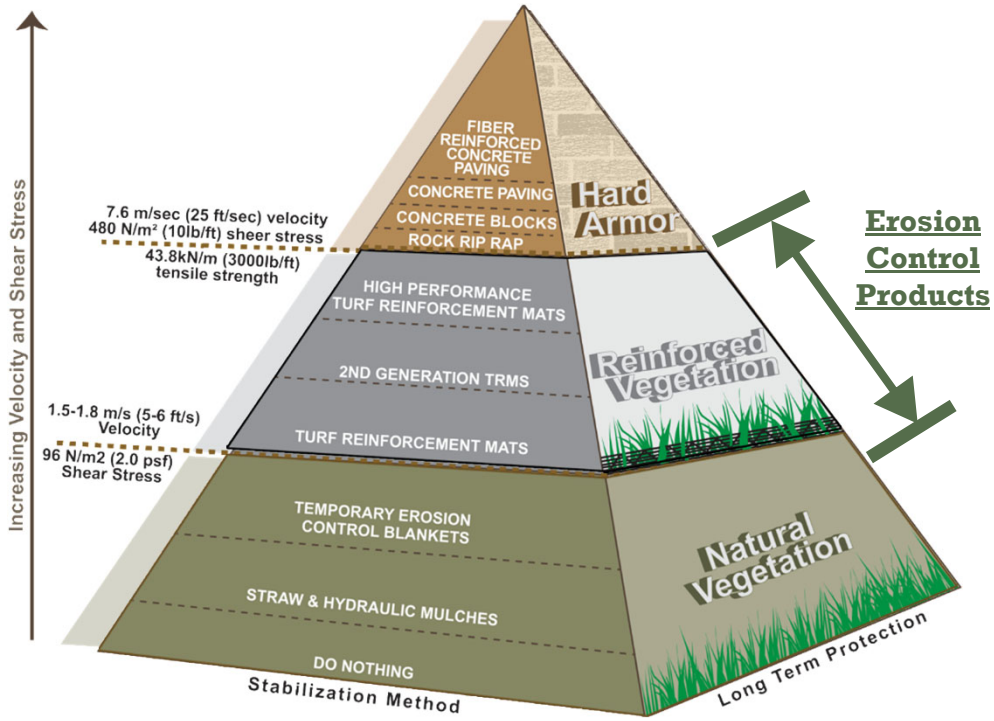
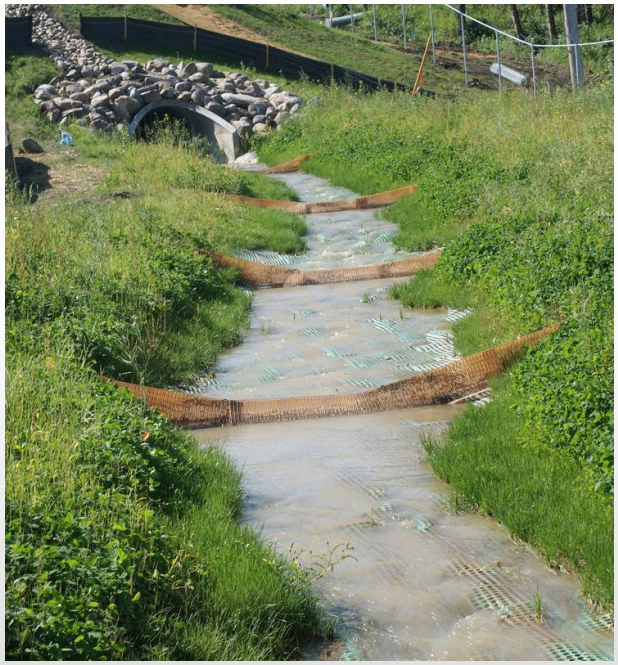
There are INNOVATIVE manufactured materials that can bridge the gap between "do nothing" and Hard Armor solutions as velocity and shear stress increases



Manufactured erosion control products and solutions can increase the limits of resistance to hydraulic forces that vegetation can provide on its own.

But Which Erosion or Sediment Control products are Bio-Friendly?



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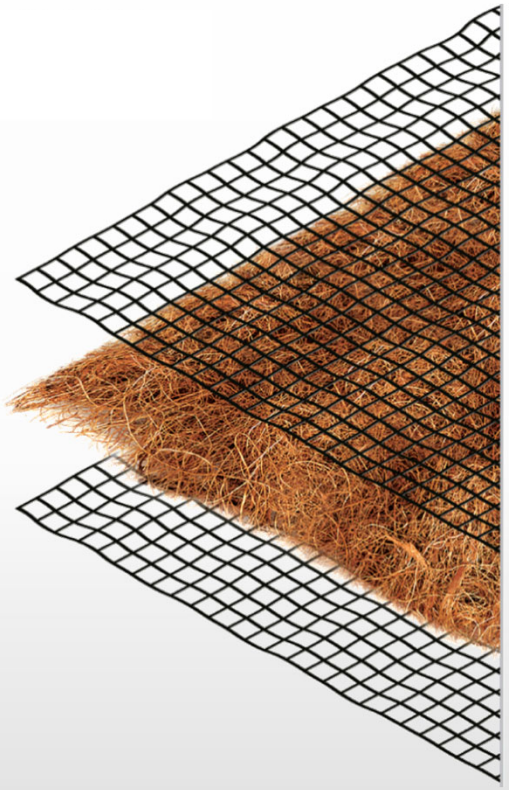
Biodegradable Erosion Control Solutions

- Temporary ECB
  - Single (top net) or a Double (top and bottom) net
  - Fiber Matrix
  - Stitching
- Natural Fiber Nets



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Typical ECB Matrix Types

- Straw Fiber – Typically Wheat or Rice
  - Biodegradable, longevity 6-12 months
- Excelsior Fiber – Machine made long wood fiber
  - Biodegradable, longevity 18-30 months
- Coconut Fiber – Imported and longest lasting
  - Biodegradable, longevity 24-36 months
- Blend – Typically Straw and Coconut
  - Biodegradable, longevity 18-24 months

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Typical ECB Netting Types

- Rapid Degradable – Typically White or Clear
  - Photodegradable, longevity 6 weeks to 6 months
- Regular Degradable – Typically Green
  - Photodegradable, longevity one year to two years
- Ultra-Violet Stabilized – Typically Black
  - Technically Photodegradable, however, extremely long lasting, longevity three years to indefinite
- ***Natural – Biodegradable Jute/Scrim***
  - ***Completely biodegradable, multiple weave patterns, less chance of wildlife entanglement, longevity two to three years***

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Why 100% Biodegradable ECBs?

- 100% Biodegradable
- Zero Joint Strength with Leno Weave
- Wildlife Easily Escapes
- Made from Jute
- Typically Provides Performance Upgrade
- Verify that products are using all-natural components, including **stitching**.

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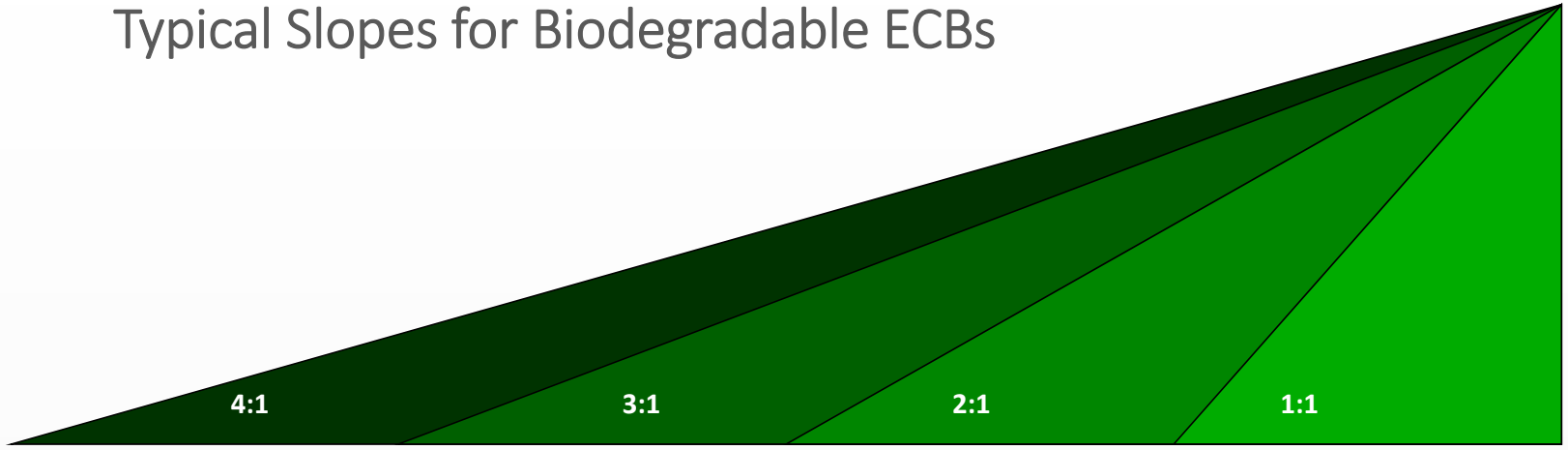
Typical Slopes for Biodegradable ECBs



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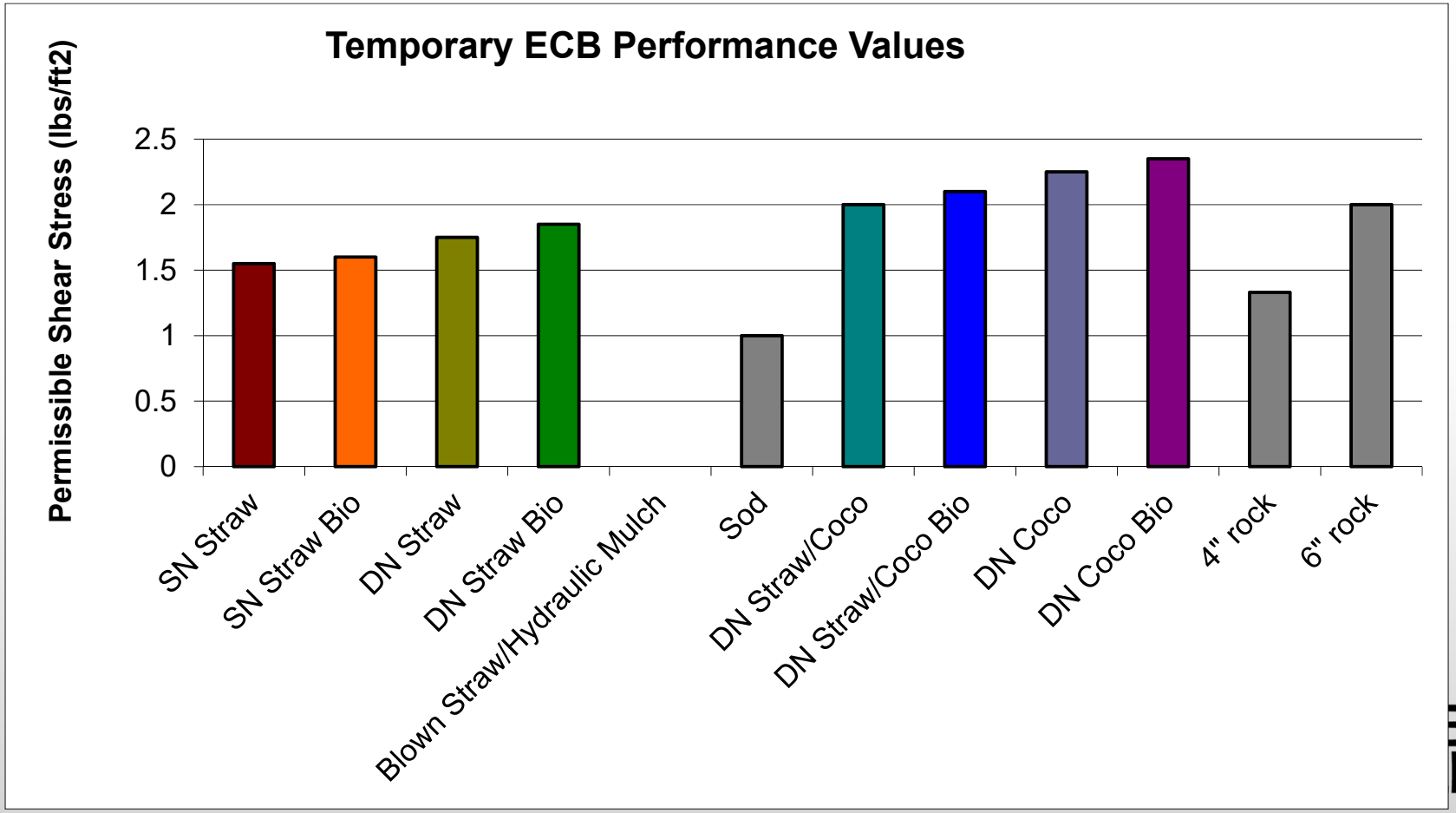
ECBs Permissible Shear Stress Comparison



Composite Designs with Bioengineering Materials

Additional Biodegradable EC products:

- Jute Woven Mat
  - Pros – Inexpensive, short life,
  - Cons – Low performance w/ greater open area
- Coir Woven Mat
  - 400 g, 700 g, 900 g
  - Pros – High tensile strength, long lasting
  - Cons – open area reduces soil protection on its own

- **Often used in conjunction with other products to get effective design solutions.**

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Biodegradable ECB Product System Applications

- **Applications**
  - Temporary protection
    - Slopes, channels, shorelines
    - Seeding and vegetation applications




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Applications for Biodegradable ECBs

- Golf course turf management
- Highways & DOT projects
- Commercial & Residential Developments
- Mines & Landfills
- Bioengineering Projects & Wetlands
- Mild to Moderate-high flow channels
- Mild to Steep Slopes
- Shorelines and waterways

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Unique Bioengineering Designs

- Pre-vegetated Blankets
- Establishment of live plants over seeding
- Waterway naturalization using fascines
- Integrated streambank designs
- Wrapped Soil lifts
- Slope and toe stabilization
- Gabion and MSE wall utilizations
- Green Roofs
- Pipelines

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Pre-Vegetated Blanket Installations

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Live Planting Applications

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Waterway naturalization using fascines

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Integrated Streambank Designs

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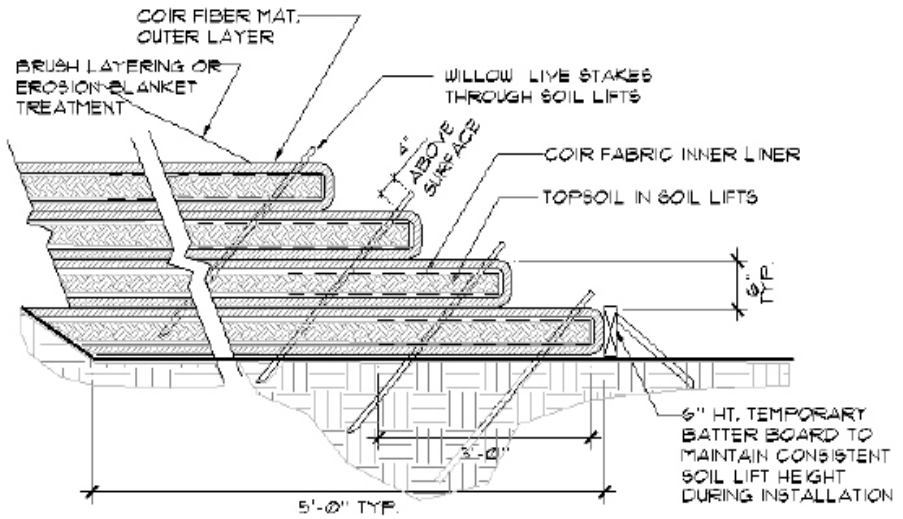
Wrapped Soil Lifts

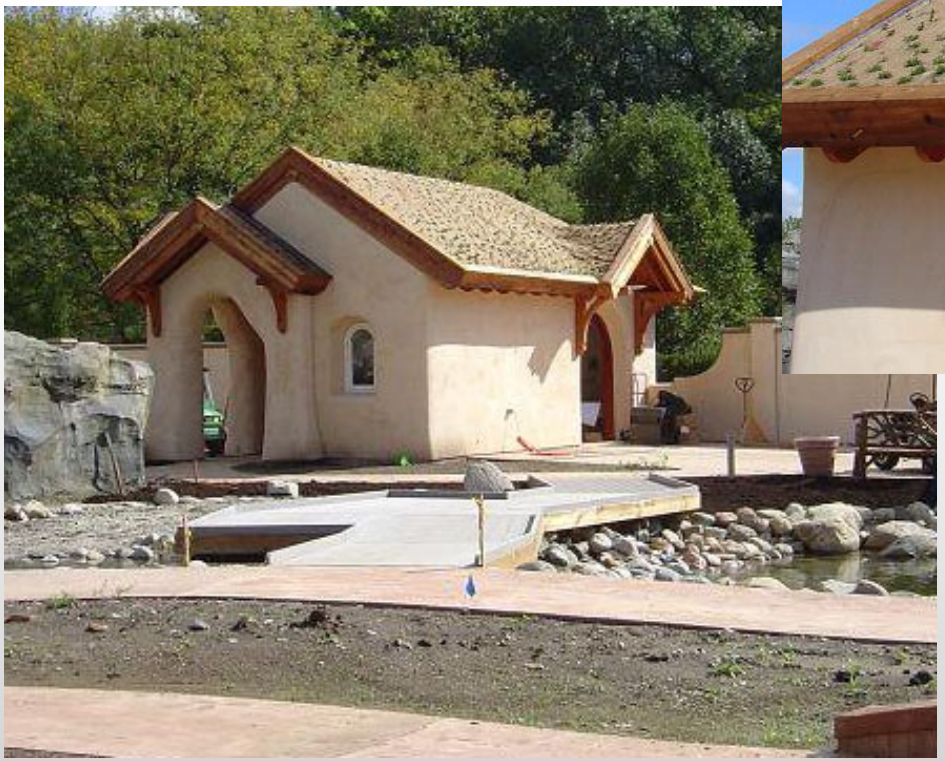


WRAPPED SOIL LIFT DETAIL

NTS

Slope and Toe Stabilization

Green Roofs



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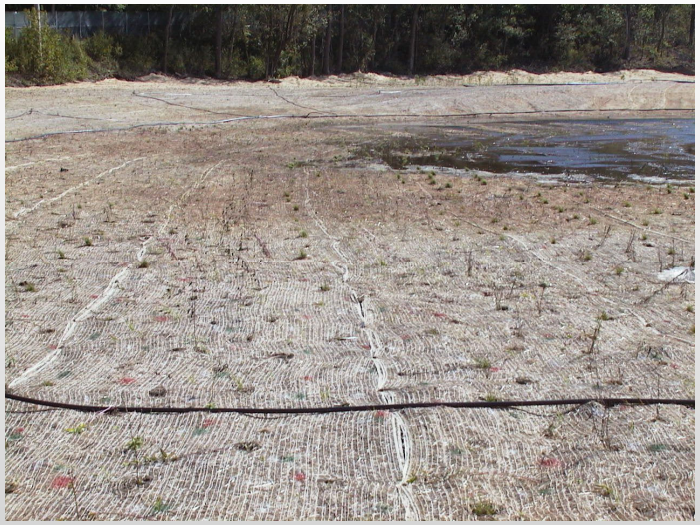
Installation considerations with All-Natural ECBs

- Natural fibered netting – absorbs more water over synthetic net, creates better contouring between soil and ECB
- Works well with plant plug and fascine planting methods as netting can be expanded for planting without cutting
- Live plants (requiring cuts) should not be installed closer than 2-3 ft on center due to netting integrity



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Installation considerations with All-Natural ECBs

- Can be installed with various fasteners
  - Wire staples/Pins – Typically 1-2 year life, may not be considered biodegradable
  - Biodegradable Plastic stakes, naturally breakdown in 1-2 years
  - Wood Stakes, great in hard and soft soils compared to other options

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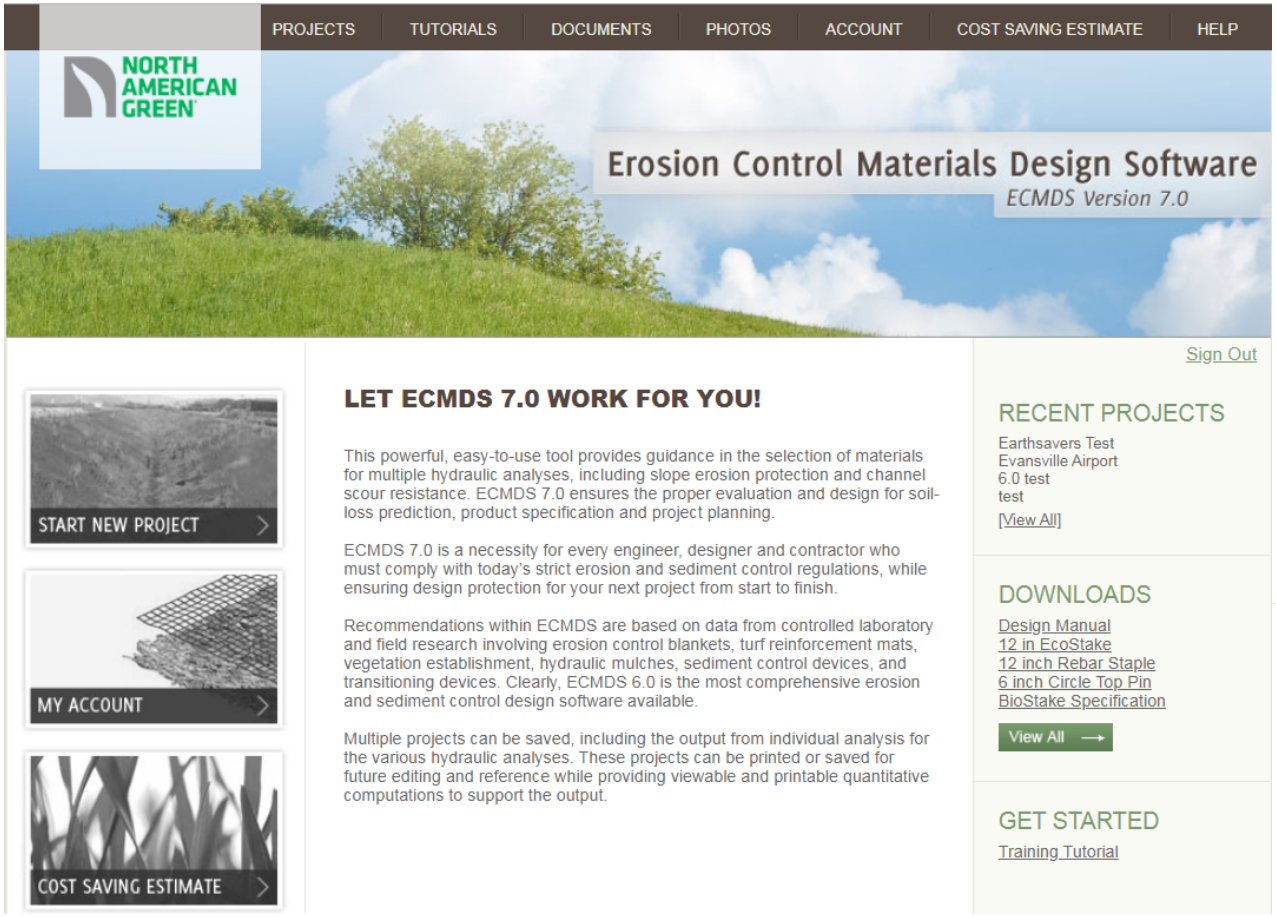
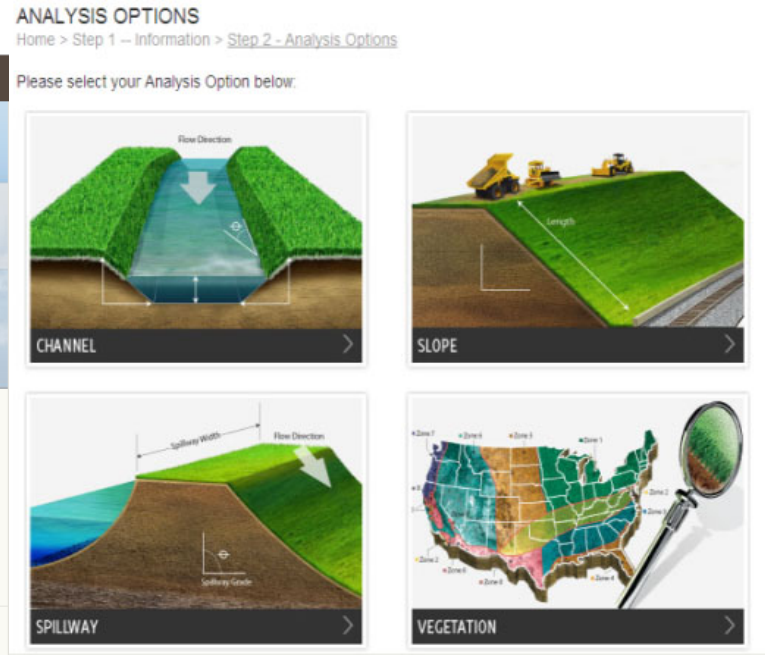
Designing for Erosion Control with ECMDS





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Biodegradable Sediment Control Solutions

To protect areas where erosion control is not applicable

- Sediment Control Systems
  - Straw / Excelsior Wattles
  - Coir Logs
  - Compost Socks
  - WattleFence

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Straw and Excelsior Wattles

- 100% straw or wood excelsior fibers
- Standard 9 inch to 20 inch diameters
- Photodegradable diamond netting or biodegradable jute net
- 1-2 year longevity

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Coir Logs

- 100% coconut fiber matrix
- Standard 12 inch diameters up to 20 inch
- Typically Coir net
- 3-5 year longevity, based on the density of the log and environment.
- Typically produced overseas

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Compost Sock

- Natural Net option
- Standard 5-inch diameters up to 12 inch (natural net)
- 12 to 18-month longevity
- Fill is compost

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WATTLE FENCE

Introduction

- Fully Biodegradable Sediment Control Device
- Hybrid Silt Fence and Wattle
- High Shipping and Storage Efficiency
- Excellent Performance
- Unique, Flexible, Innovative and Useful

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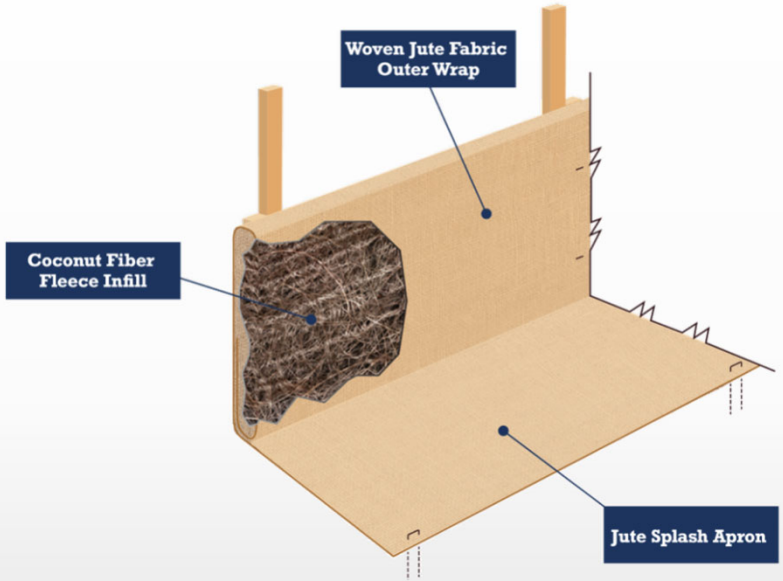
WattleFence Specifications



Height	9 inch
Length	100 ft
Splash Apron	6 inch
Packaging	16 units/pallet

Key WattleFence Feature

FEATURES (What it is and or does)	ADVANTAGES (How is it better)	BENEFITS (What does that mean for the customer)
6 in Jute splash apron	No trenching required for install	Reduce dirt moving, install time and equipment usage
9 inch height	High flow rate allows for reduced height compared to silt fence	Easier to maintain, allows “step over” on construction sites

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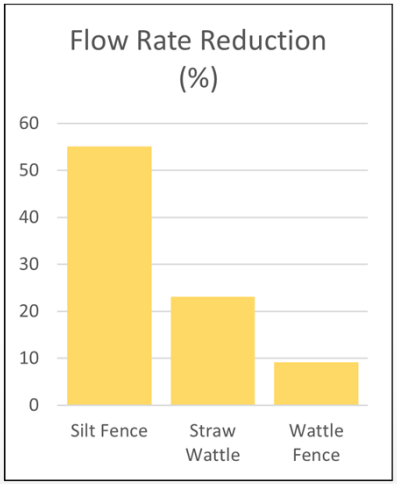
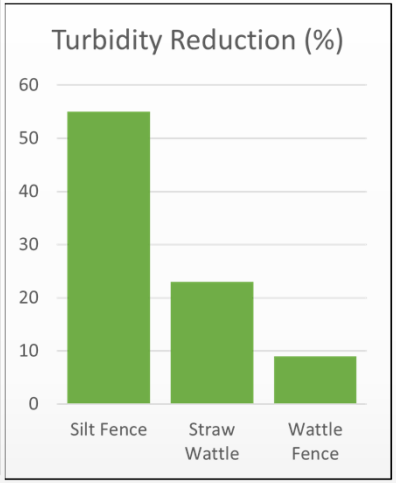
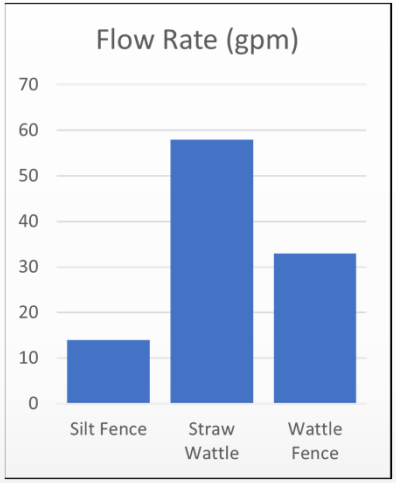
Wattle Fence Performance







Key WattleFence Feature

FEATURES (What it is and or does)	ADVANTAGES (How is it better)	BENEFITS (What does that mean for the customer)
Multiple filtration layers	Sediment capture comparable with other SRFRs but with increased flow rate	Provides sediment capture of silt fence while allowing more flow through, reducing overtopping

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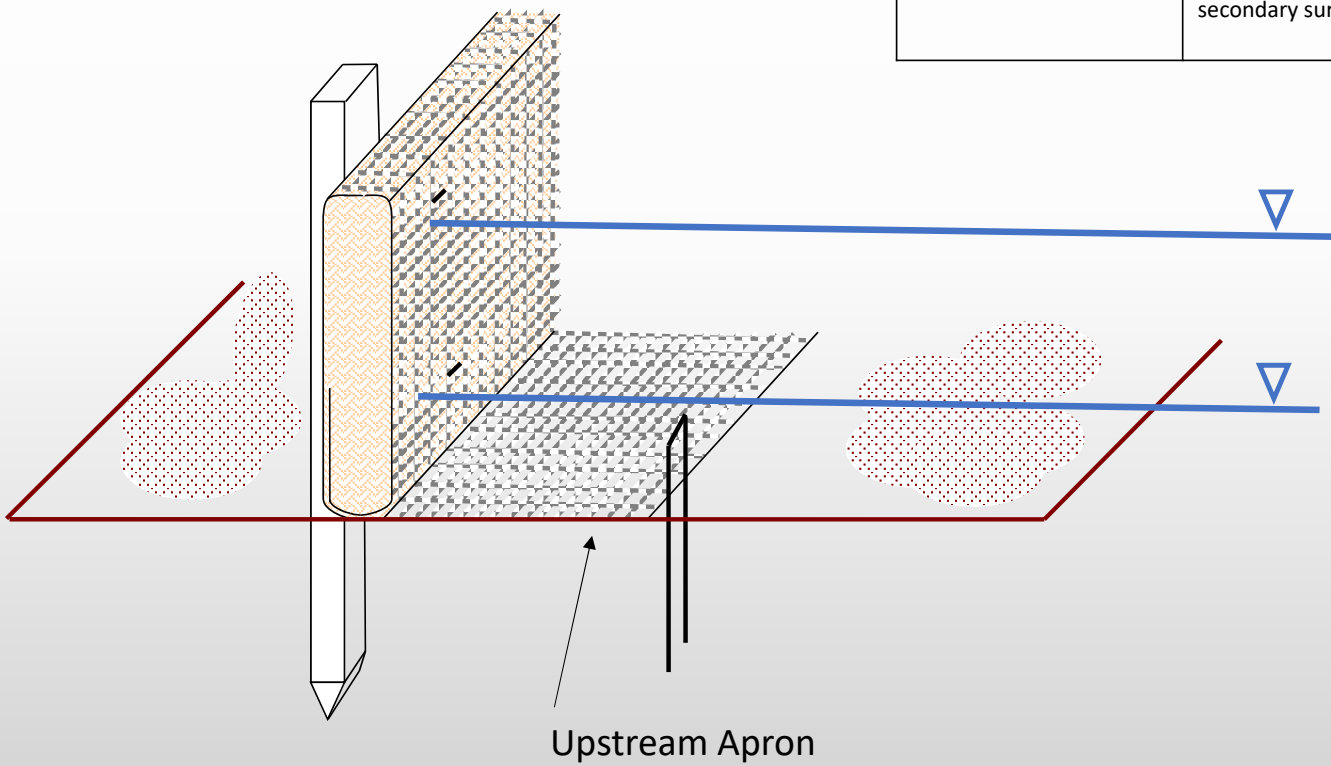
Two Stage Filtration

Key WattleFence Feature

FEATURES (What it is and or does)	ADVANTAGES (How is it better)	BENEFITS (What does that mean for the customer)
2 stage filtration	Performs at low flow and secondary surge flows	Provides sediment containment in varying conditions and applications



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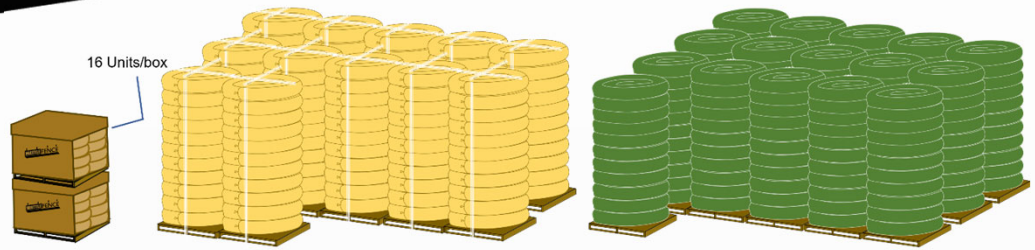
Shipping and Handling

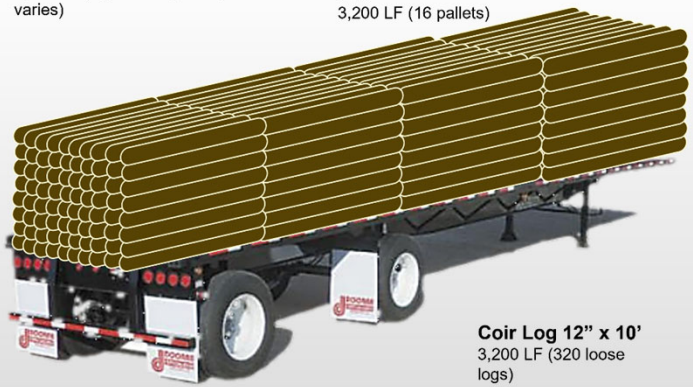


WattleFence
3,200 LF (2 pallets)

Straw Wattle 9” x 25’
3,200 LF (approx. 12 pallets, varies)

Compost Sock 8” x 200’
3,200 LF (16 pallets)

WattleFence
3,200 LF (2 pallets)



Coir Log 12” x 10’
3,200 LF (320 loose logs)

Key WattleFence Feature

FEATURES (What it is and or does)	ADVANTAGES (How is it better)	BENEFITS (What does that mean for the customer)
Tight roll packaging	High volume pallet shipping and handling	Can replace up to 20 times the space of sediment logs, and a few pallets can deploy over a mile of protection

WATTLEFENCE

Installation

Key WattleFence Feature

FEATURES (What it is and or does)	ADVANTAGES (How is it better)	BENEFITS (What does that mean for the customer)
99% biodegradable	Naturally breaks down with no plastics or microplastic pollution	Fasten and forget. No need to remove or dispose from project site

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WATTLE FENCE

In Field Performance

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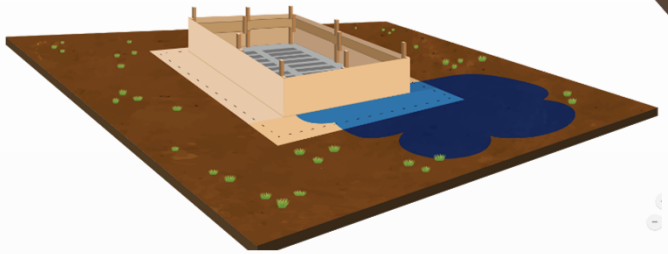
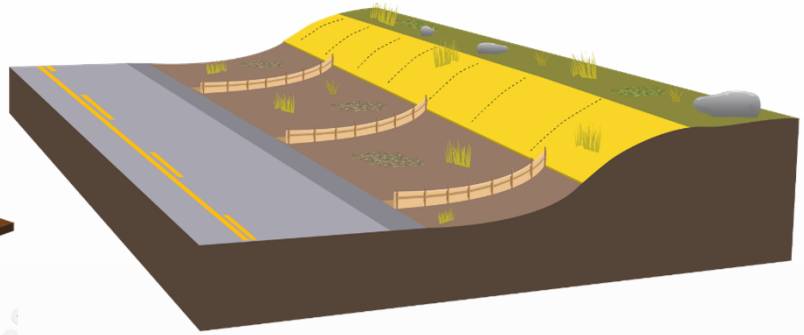
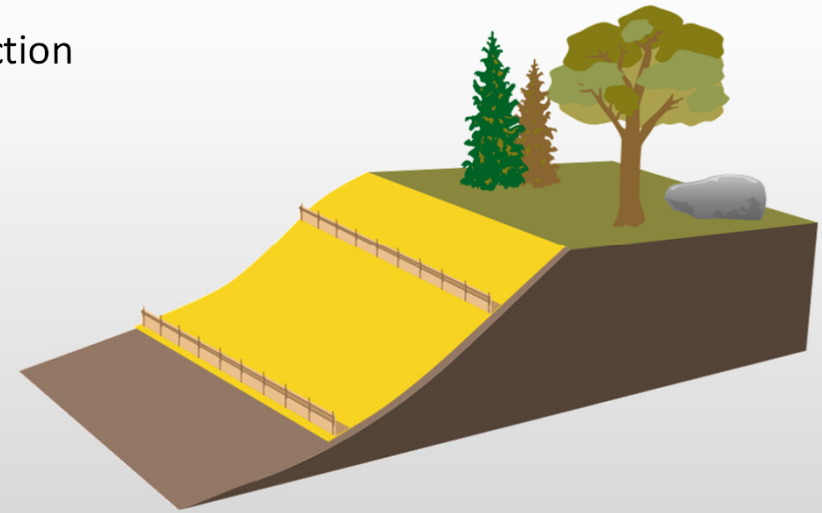
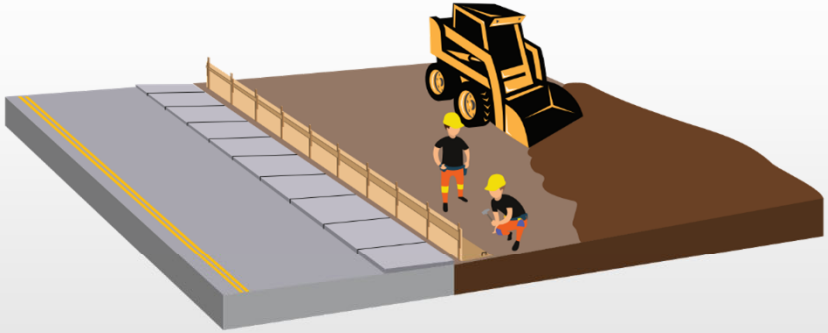
Wattle Fence Applications

- Slope Interruption
- Perimeter Control
- Channel Dissipation
- Stockpile Containment
- Drain Protection
- More!









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Steep Slope – Slope Interruption Device

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Toe Protection

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Perimeter Control

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Forest Fire Rehabilitation

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Active Construction Sites

Drain/Inlet protection

Stockpile/Perimeter control

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Takeaways

- Biodegradability has its limitations when it comes to long-term performance.
- 100% Biodegradable products have benefits for effective full degradability, and wildlife friendly
- All-natural products can see an increase in sediment capture and control compared to other options on the market
- Biodegradable erosion and sediment control products can be used on a wide-range of project applications and with a wide range of vegetation types, including turf species, natives, live-plants, plugs, fascines and more.

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Thank you for your time! Questions?

Website Resources
Westerngreen.com
ECMDS.com

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