Improved Innovative Streambank Restoration Techniques

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Objective

- Educate the professional community involved in streambank and shoreline restorations using soil bio-engineering techniques of the technically sound **latest developments and improvements in coconut fiber (coir) products** used for streambank and shoreline restorations

Soil Bioengineering & Coir

- **Soil bioengineering** is an interdisciplinary approach to environmental restoration which protects water resources by combining biological systems with engineering principles to restore deteriorated soil masses
- These techniques use mature vegetation to resist erosive forces
- Strong, durable, natural and biodegradable **coir products** are used to provide initial soil protection and support young vegetation until mature vegetation becomes established

Advantages of Bio-Engineered Streambank Restorations

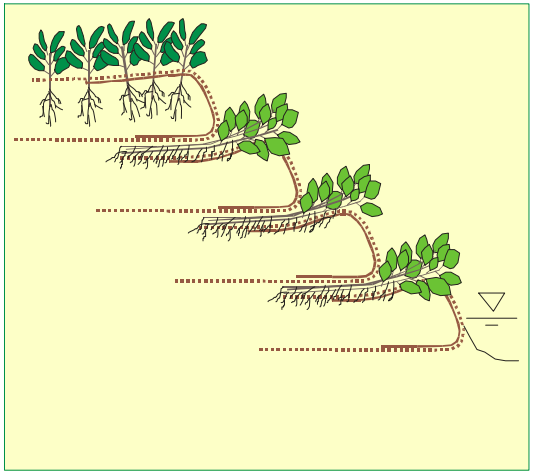
+ Aesthetically pleasing applications
+ Provides habitats for fish and other wildlife
+ Nourishes a naturally strong, healthy environment
+ Supports recreational activities
+ Creates an environment that reduces human stress
+ Conveys peace of mind for all of us

Advantages of Coir products with Thick Fiber Cover on Streambank Restorations

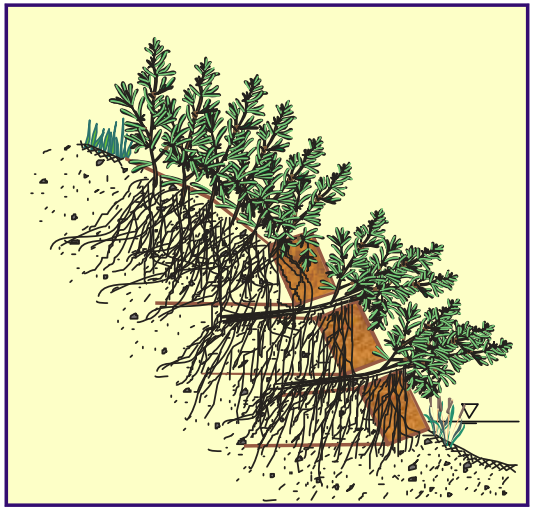
+ Coir is a renewable natural resource
+ By product of coconut industry
+ High functional longevity (over 6 years)
+ Higher degree of abrasion resistance
+ No harm to wildlife
+ Proven performance over the years

Streambank Restorations Done with Coir Products

- **Phase I**
  - Structural stability (support) and protection against erosion provide by coir products



- **Phase II**
  - Fully or partial structural stability(support) and protection against erosion come from natural vegetation



Coir Products for Streambank Restorations

1. **Coir Block System** – Rectangular coir fiber block with three sides wrapped in a woven coir matting and the coir matting extends outward of the coir fiber block

2. **Coir rectangular log** – Coir log with rectangular shaped cross section

3. **Coir circular log** – Coir log with circular shaped cross section

Coir Block System

- Thick coir fiber block provides **stronger abrasion resistance** at the face of the lift
- Thick coir fiber block **prevents exposing the soil** in the soil lift for 6-10 years, allowing vegetation to grow on soil mass while preventing chances for failure
- Combination of coir fiber block & high strength coir fabric **provides significantly higher shear stress resistance** for extended time than soil lifts made of wrapping coir fabric only

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Coir Log with Rectangular Shaped Cross Section

- Until now, coir Log with rectangular shaped cross section is not common in streambank restoration designs and constructions

Coir Log with Circular Shaped Cross Section

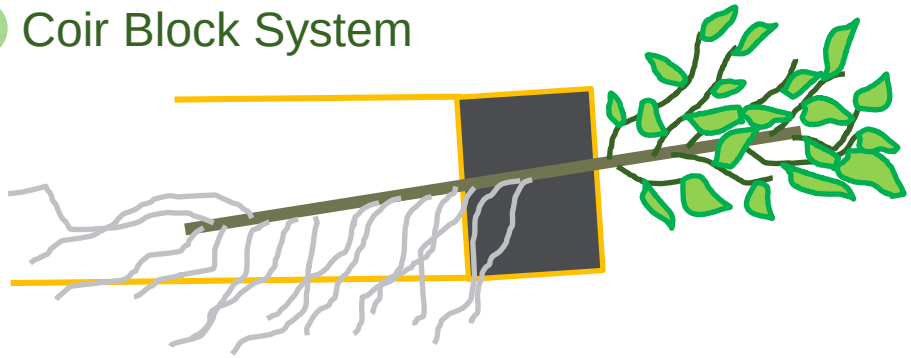
- Coir Log with circular shaped cross section is very common in streambank restoration designs and constructions

Improvements

1. Invisible holes for planting and anchoring
   - These holes can be used for planting during construction or after construction
   - Growing plants will provide better anchoring of the product
2. Netting pouch at one end of the product
   - Facilitates strong connections

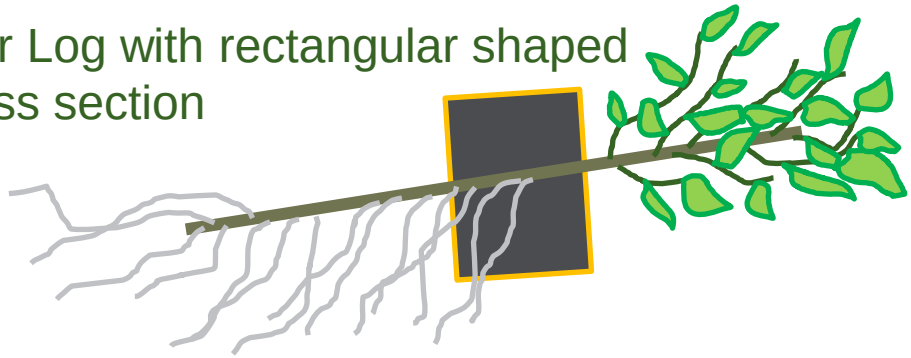
Improvements

1 Coir Block System

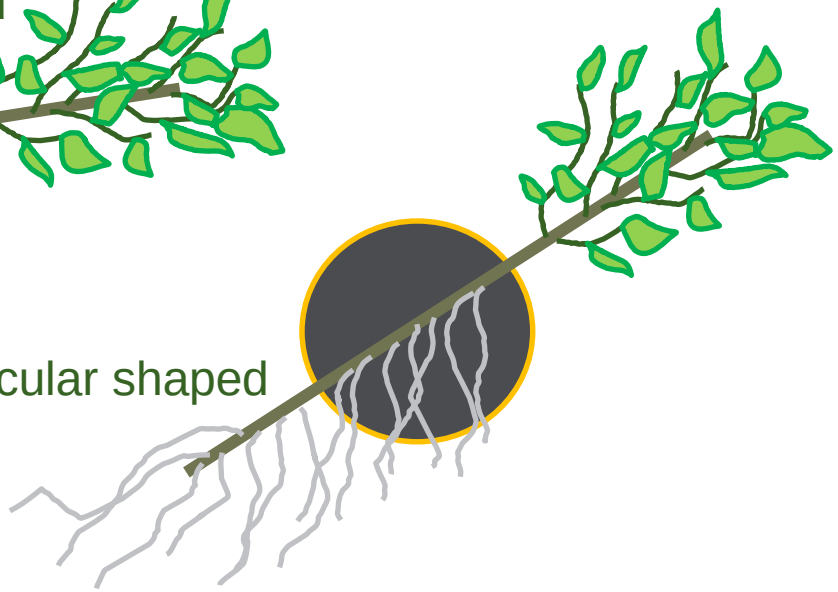


Strong additional anchoring develops with time from the roots of the growing vegetation

2 Coir Log with rectangular shaped cross section



3 Coir Log with circular shaped cross section



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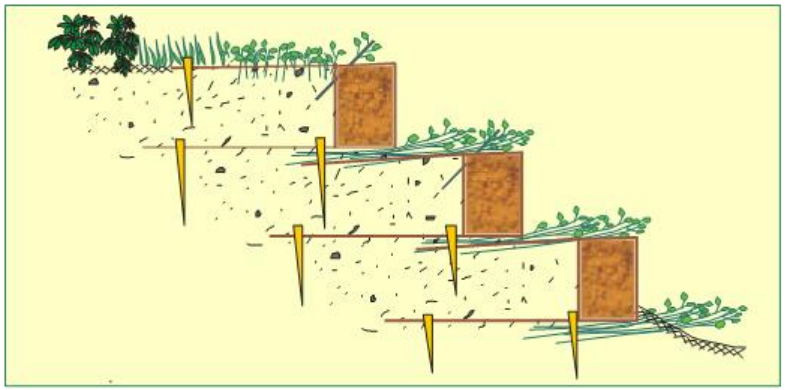
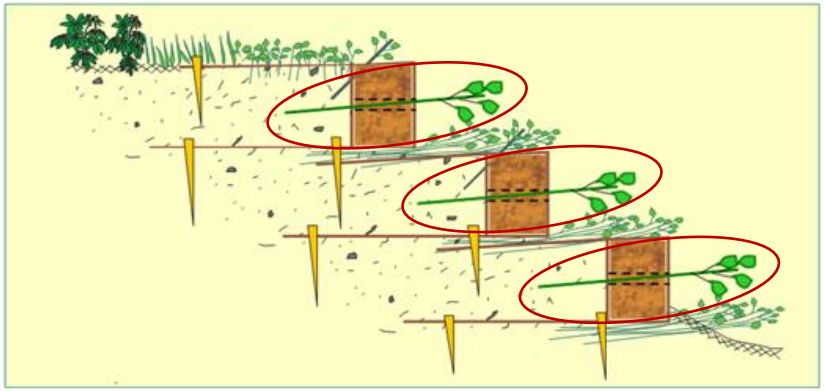
Coir Block System Improvements

Before



Unable to plant through coir block

After



Ability to plant through the coir fiber block after improvements

Rectangular Coir Log Improvements

1. Appearance

2. Pulling out coir fiber plugs from invisible holes

3. Planting and anchoring using invisible holes

4. Structurally sound connection

Circular Coir Log Improvements

1. Appearance

2. Pulling out coir fiber plugs from invisible holes

3. Planting and anchoring using invisible holes

4. Structurally sound connection

Coir Block System Field Demonstration

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Rectangular Coir Log Field Demonstration

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Circular Coir Log Field Demonstration

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Field demonstration using coir plugs as reverse wick drains

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Conclusion

1. Invisible holes
   - These holes can be used for planting and anchoring
   - Over time vegetation replaces rope anchors
2. Netting pouch
   - Facilitates strong connections
3. Wick drains
   - Provides drainage paths to ensure adequate moisture levels; essential for the development of live plant cuttings

Thank You!

Quality Matters!

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