HABITUBES AS A RESTORATION TECHNIQUE

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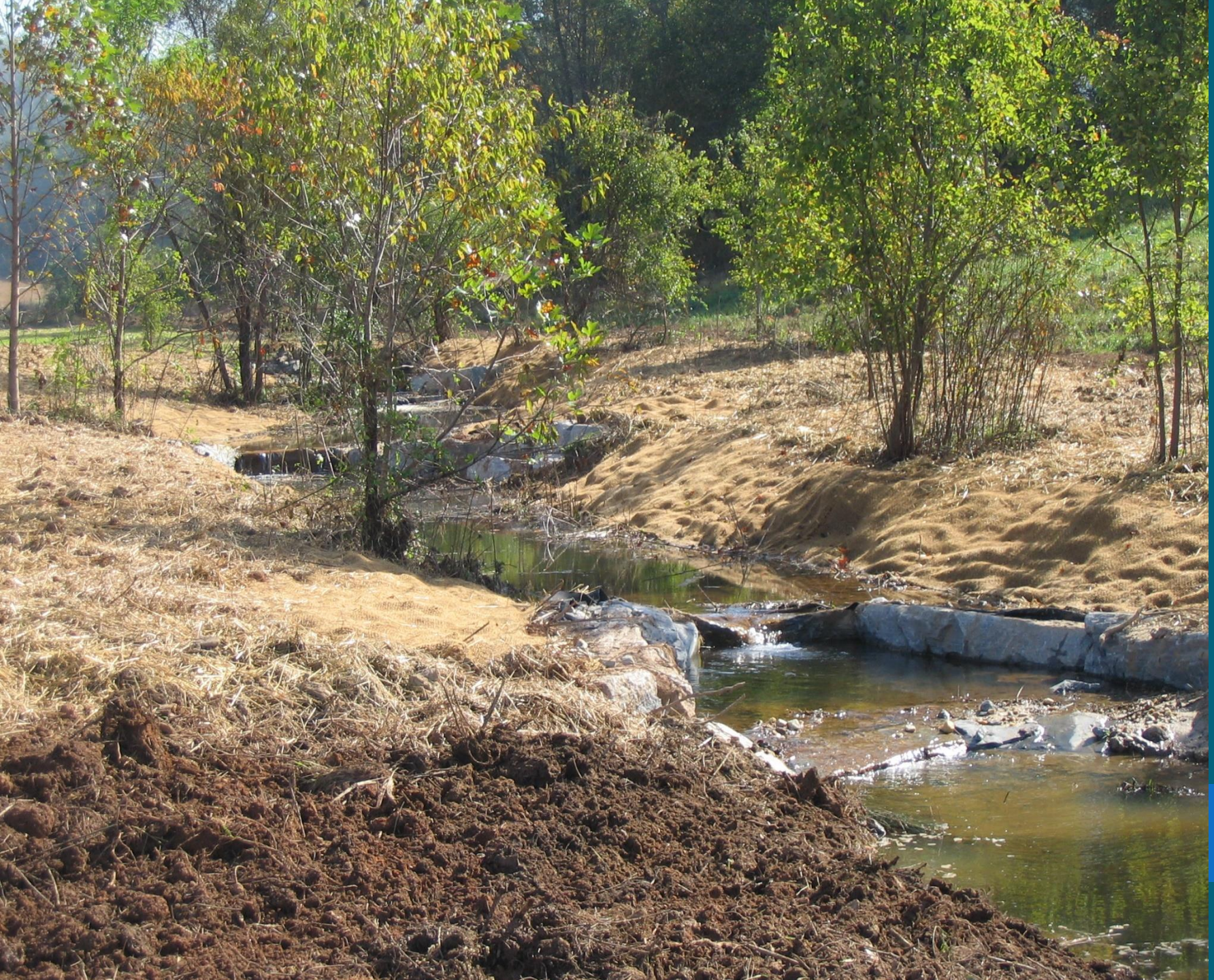
Stream Restoration Mantra:

If You Build It,
They Will Come!

For the last 20 years … why has stream restoration not worked more effectively for aquatic biology?

Stream restoration work has historically focused on channel structures and bank stabilization.



Stream restoration has focused on the "Superstructure of a Living Habitat" but none of the living areas or habitats that are needed by living organisms.

What has been omitted?

- **Variable Types of Habitat**
- **‘Micro’ Habitat**
- **Food for Organisms**

As science of restoration continues to grow.

…… understand, habitat restoration and ecological lift have become integral parts of every design.

Past & Present
Stream Restoration Projects & Bugs

- Habitat and microhabitat is minimal for organisms.
- When habitat is available, there is little to no material that is available or cultured to provide food for organisms.
- Little or no available food.
- Source of food is absent (eg., leaves, twigs, etc.).
- Usable organics are absent.
- Few to no organisms are available to repopulate the area.
- Hyporheic Zone/substrate has little or no source of microbes, fungi or organic material.
- If a refugium (source) is available, the restoration area has no habitat and food source available to hold species in place.
- Macrobenthic organisms do not move upstream very readily during aquatic stages.

Present & Future
Stream Restoration Projects & Bugs Solutions

- Restore Leaf Pack
- Restore Woody Debris
- Restore Usable Woody Debris
- Create Habitat
- Create Microhabitat
- Add The Right Kind of Usable Organics
- Provide Food for Organisms
- Promote Fungi Growth
- Promote Bacterial Growth

How did we get here?

- We have been working on this for last 4 years;
- We have tested numerous techniques and materials;
- This is in response to trends we are seeing;
- Regulatory requirements;
- Need for a way to relocate organisms from one stream to another;
- Need for Ecological Lift;
- Provide a way to speed up the restoration process;
- Need for a Cost Effective Solution.

HabiTubes

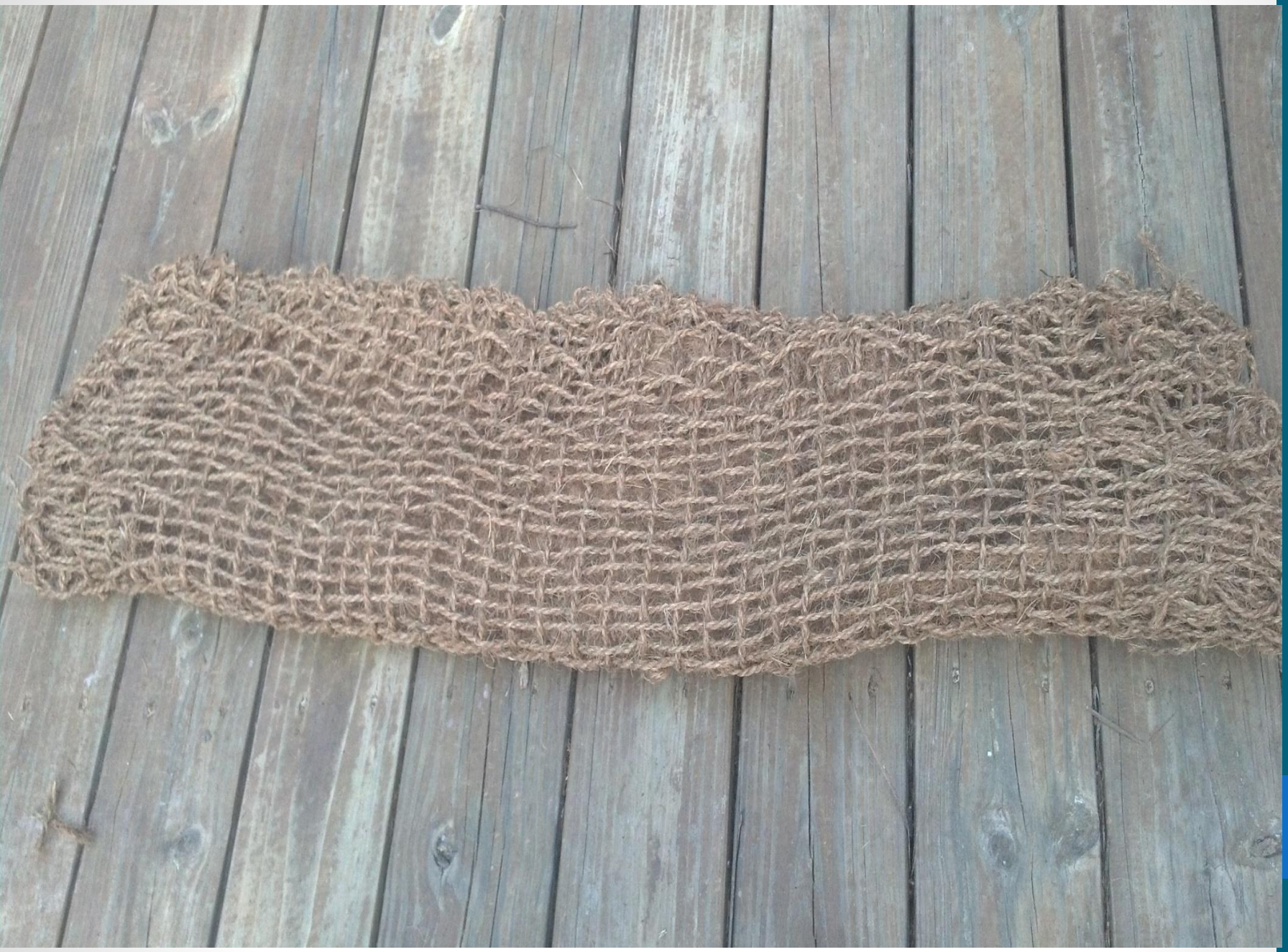
For Leaf Pack Restoration

Goals of HabiTubes are:

- Habitat Creation
- ‘Micro’ Habitat Creation
- Semi-Permanent Food & Habitat Source
- Ability to Move Organisms
- Create Ecological Lift
- Speed up the Restoration Process
- Affordable Alternative

HabiTubes
For Stream Restoration

- Artificial and natural way to keep leaf pack and woody debris in place for extended time.
- A way to move organisms from one stream to another.
- Can be used to enhance a struggling system.
- Can be refilled.
- If left in a stream, the material still offers habitat for organisms.
- Place for organisms to hang on in streams with flashy high flows.
- Can be a way to add and hold the proper type of organics in a stream.
- A way to stop the peak and drop of macrobenthic organisms after a restoration effort.

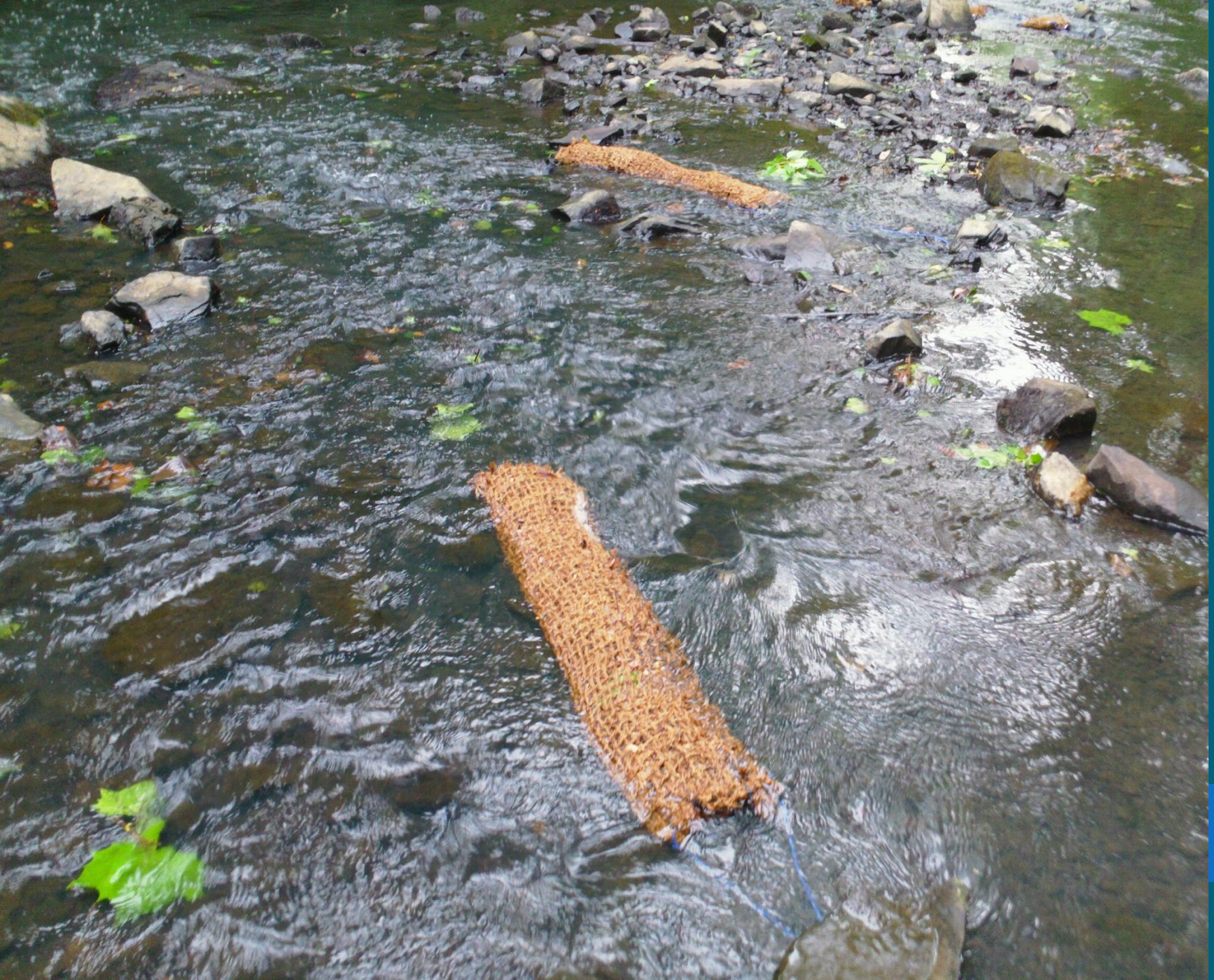


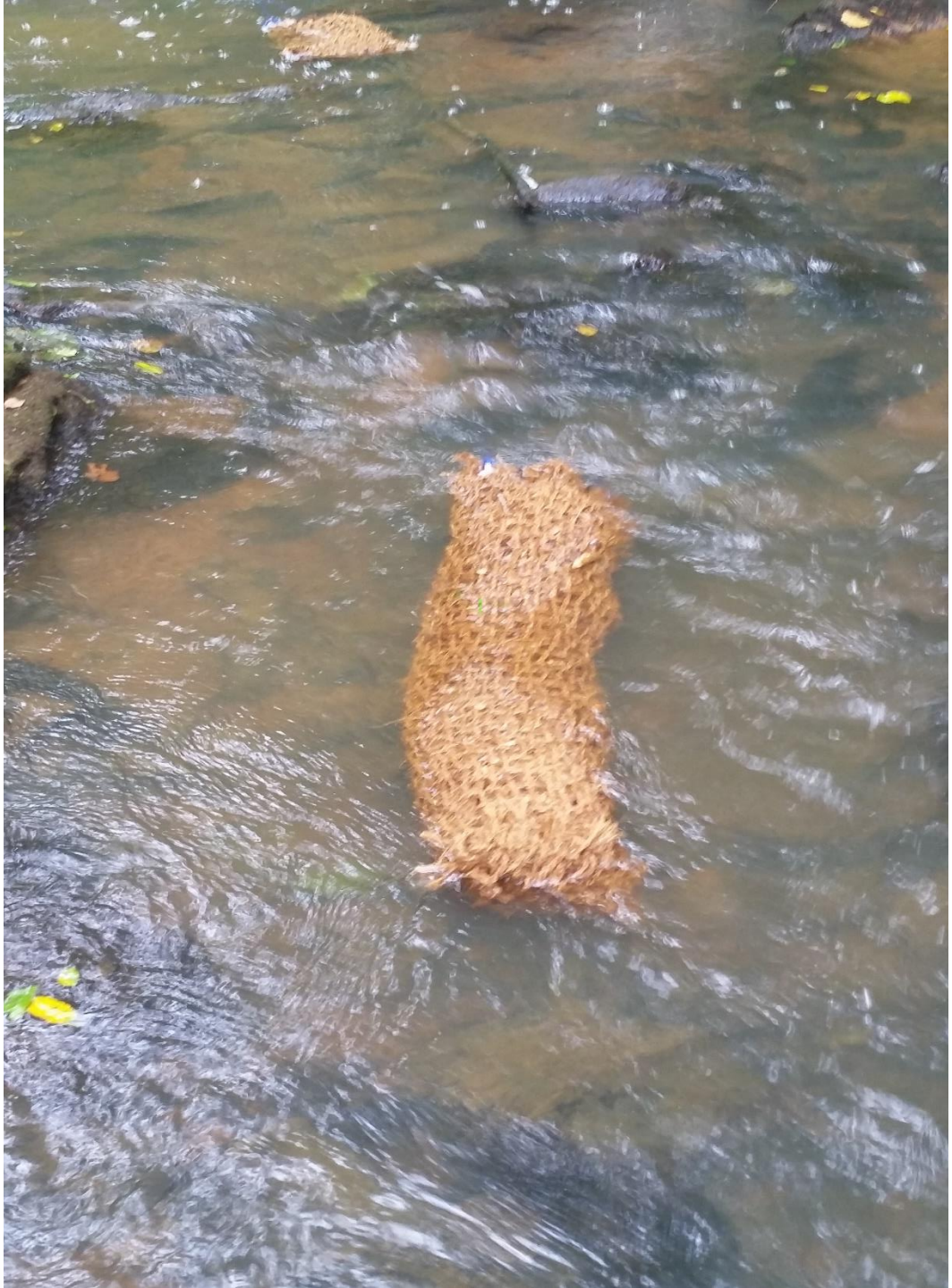
HabiTubes

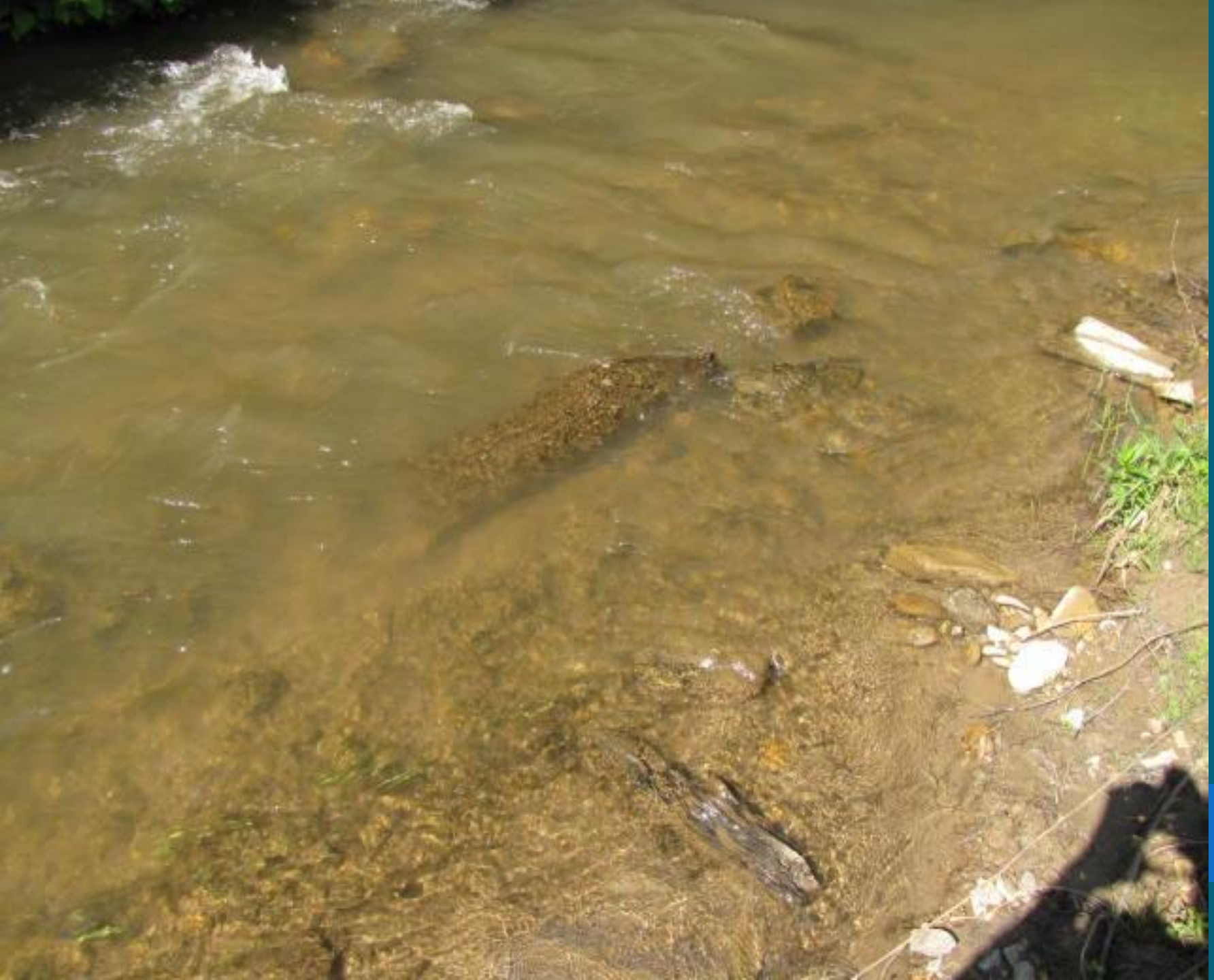
For Leaf Pack Restoration

- Recreates Leaf Pack
- Recreates Woody Debris
- Provides a Food Source for many MBO's
- Provides Growth Medium for MBO's
- Provides Habitat for MBO's
- Provides stable platform in flashy high flows
- Provides Microhabitat for MBO's
- Provides Ecological Lift
- Relocation Method for MBO's
- Natural Product
- Environmentally Friendly

MBO's = Macrobenthic Organisms





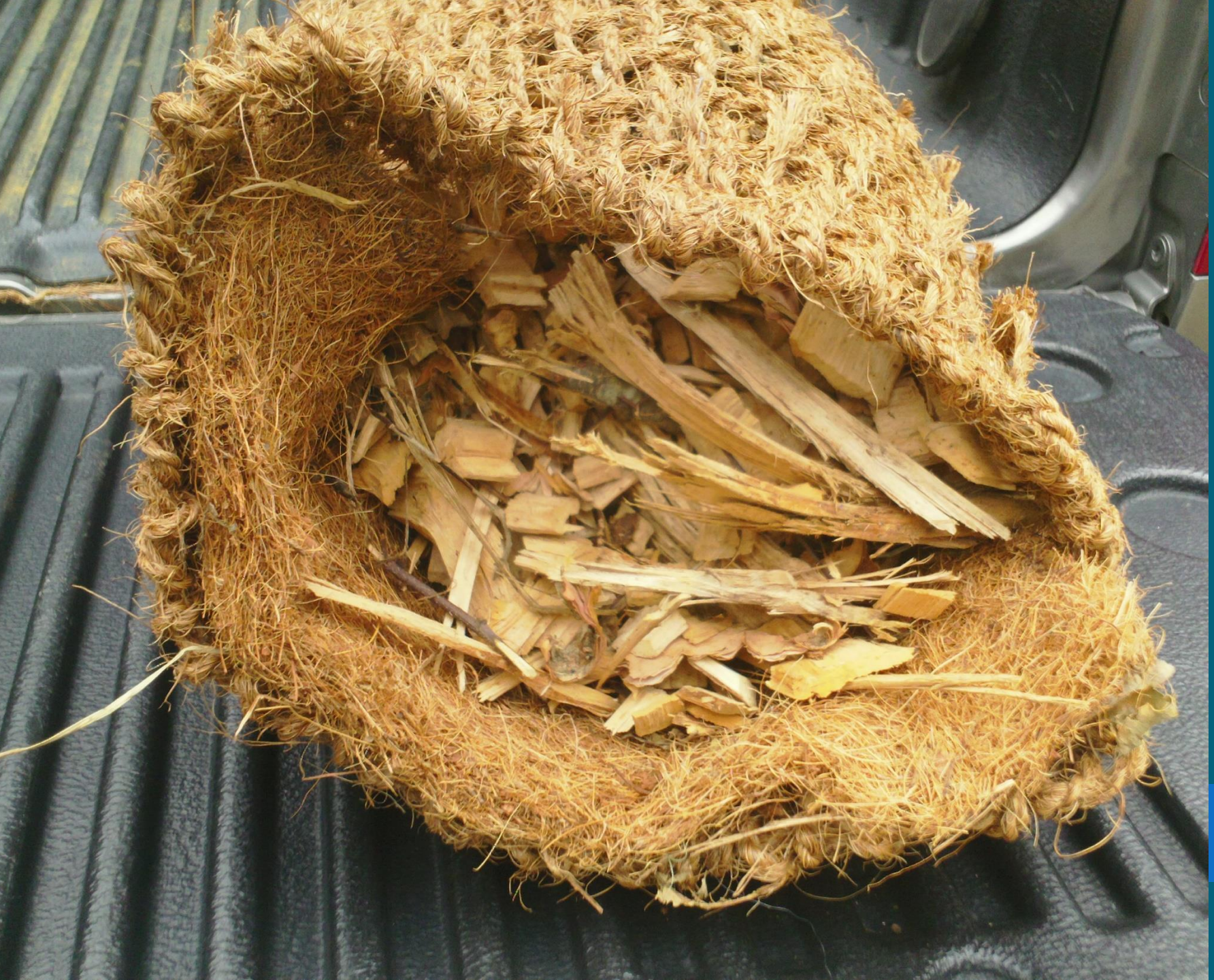


Eastern U.S. Materials:

- Oaks
- Maples
- Gums
- Ashes
- Birch
- Sycamore
- Woody Materials
- Fish Food

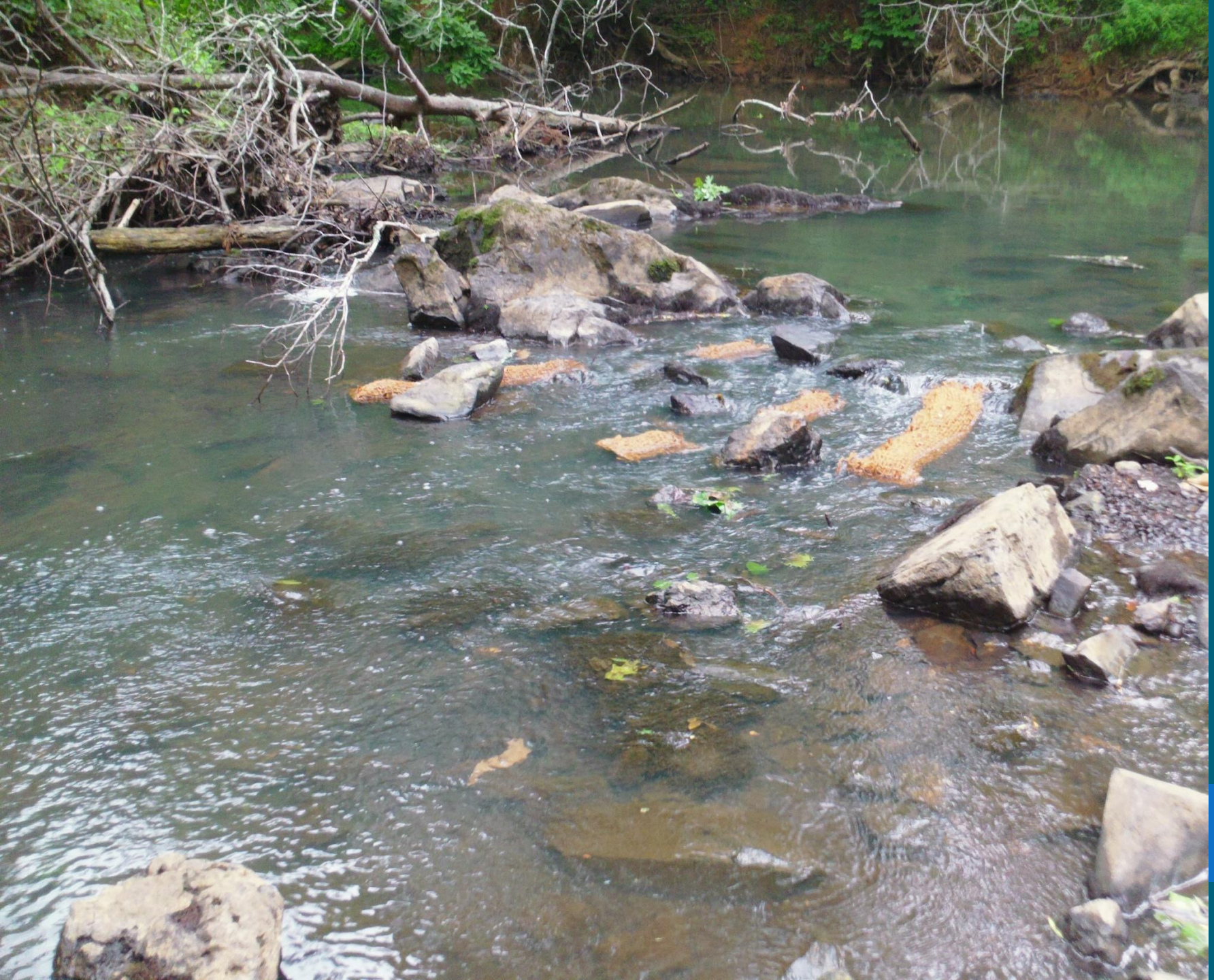
Types of Woody Debris

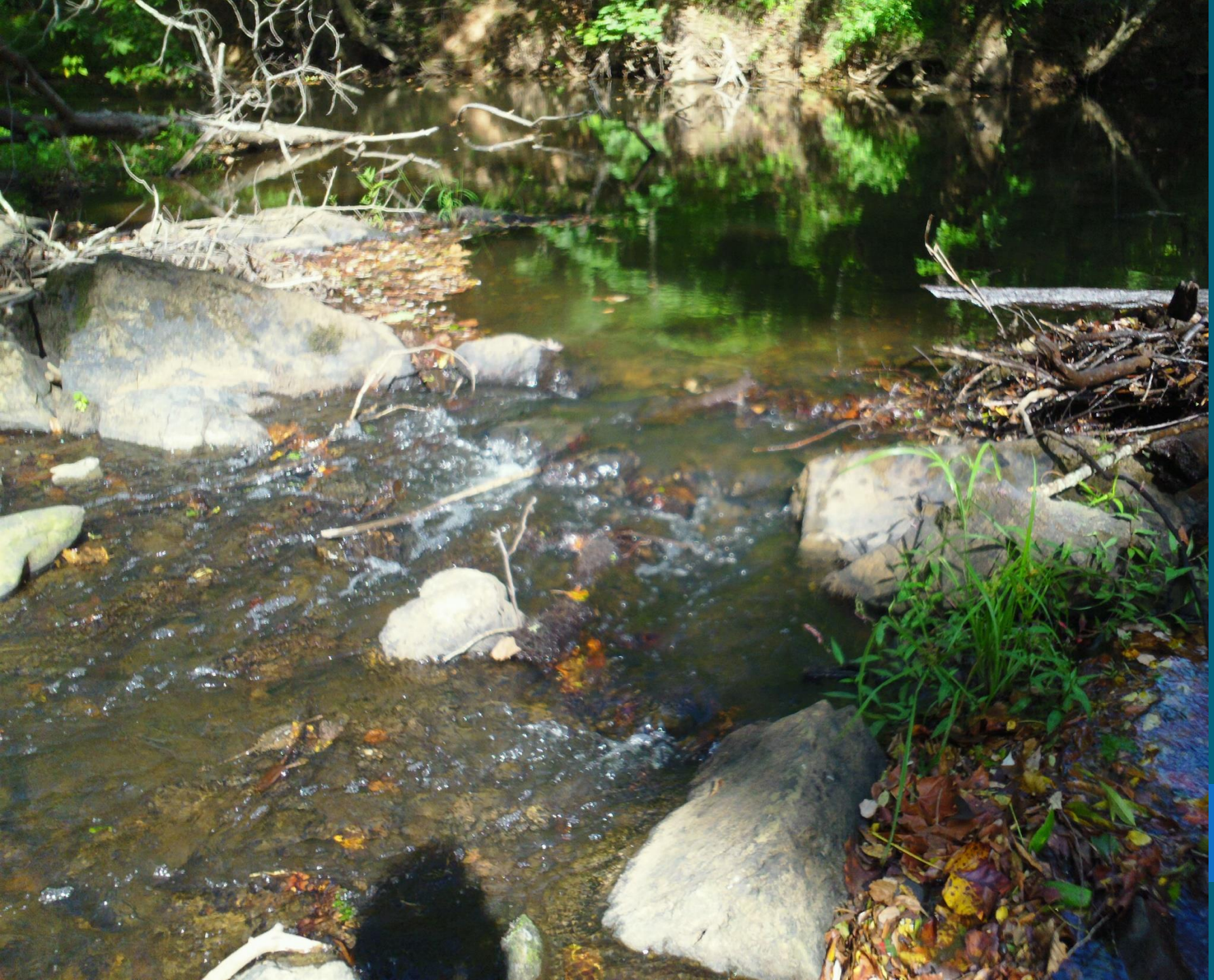
- Small sticks.
- Larger sticks cut into 6 inch sections or smaller.
- Rotting wood.
- Wood Chips.
- Wood Shavings.
- Can be shaped into logs.
- Can be utilized for brush toes.



Installation Guidelines

- HabiTubes are installed in riffles and glides of streams.
- Install at least one HabiTube per riffle.
- What is the average width and depth of stream riffles?
- Can be refilled every 6 to 8 weeks. In the fall and winter the reduction of the leaf material slows.
- HabiTubes are staked to the bottom or attached to rocks in streams.
- Install in locations where water levels will inundate at least one-third the width of the HabiTubes
- Can be made to any size that is needed for a project.





Installation Guidelines

Bank Full Width	Sample Bag		Small Tube		Medium Tube		Large Tube
0 to 10 Feet	1		1				
10 to 20 Feet	2		2				
20 to 30 Feet	3		3	or	1		
30 to 40 Feet	4		4/6	and	2/1		
40 to 50 Feet	6		6/8	and	4/2	or	2

* Installation guidelines are general guidelines.

Each project will have specific guidelines and goals that become part of the design.

Relocation Guidelines

- **Water Quality has to be similar between donor and receiver stream systems.**
- **Utilize similar stream orders for donor and receiver streams (1 to 5th order streams have useable assemblages of MBO's).**
- **Roughness of the stream.**
- **Relocation of usable organic material.**
- **Useable woody material.**
- **Stream average width and depth at riffles.**
- **Anchor points.**
- **Add additional HabiTubes downstream to receive displaced organisms.**

Findings

- The longer the HabiTubes stay in the water the more organisms utilize them.
- During spring and summer the HabiTubes have to be refilled every 6 to 8 weeks.
- During the fall and winter materials in the HabiTubes will be consumed at a slower rate.
- HabiTubes create a “micro” ecosystem that attracts organisms to their general location.
- Early on the May flies tend to stay on the outside of the HabiTubes. If algae is allowed to establish on the HabiTubes, the May fly numbers increase.
- Organisms like to nest in the HabiTubes.
- Salamanders, crayfish & newts utilize the HabiTubes.
- When the HabiTubes are added to a typical Qual IV Sampling Technique the number of taxa found in the sample increases by 30 to 50 percent.

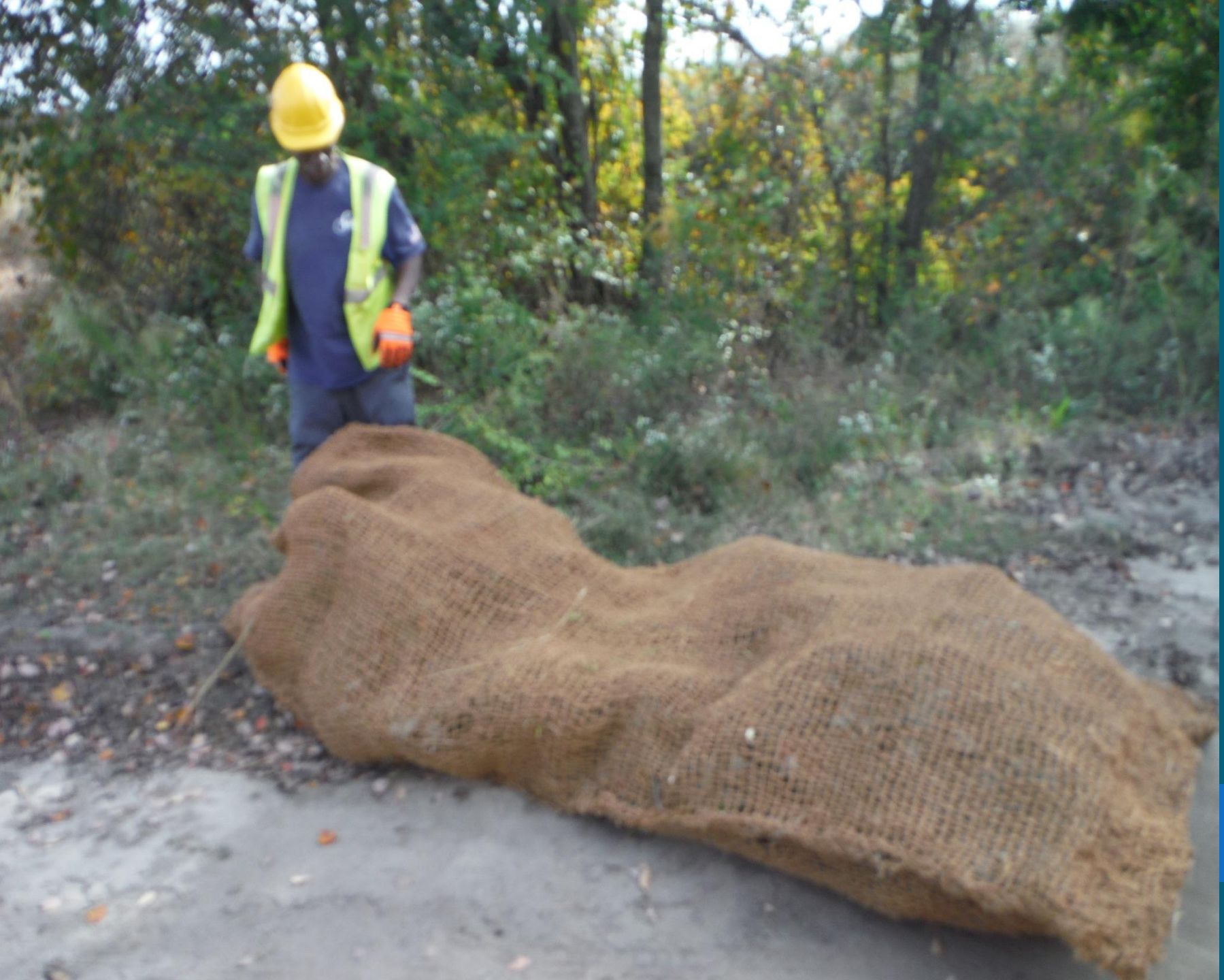
Findings (continued)

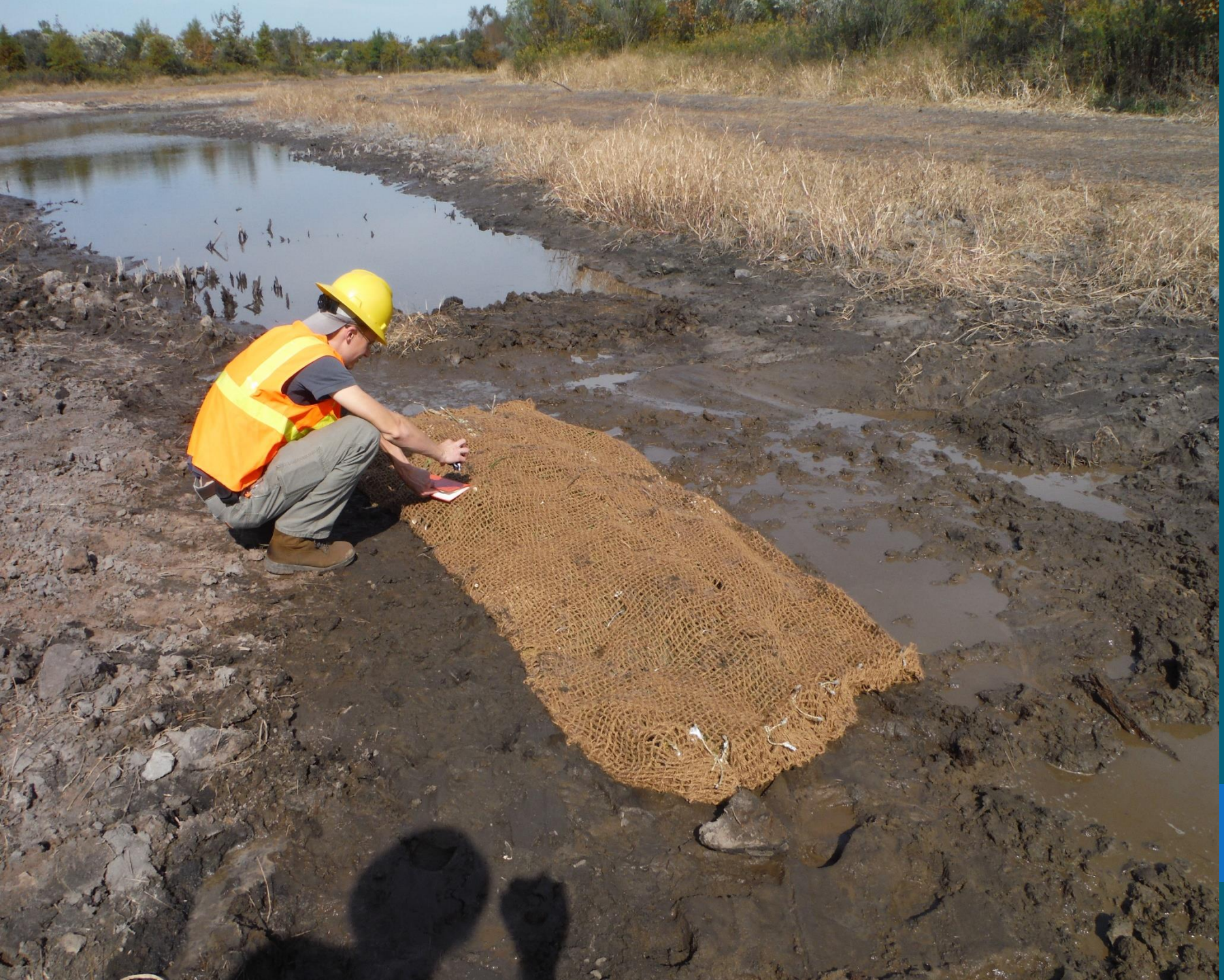
- Relocations can best occur every 6 to 8 weeks.
- HabiTubes placed in a donor stream in the late fall can be relocated in the early spring.
- Relocations can occur during any time of year.
- Provide ecological lift for mitigation projects.
- Provide biotic restoration for delisting streams from 303(d) listings.
- Restore biotics as required by litigation.

HabiTubes Sizes

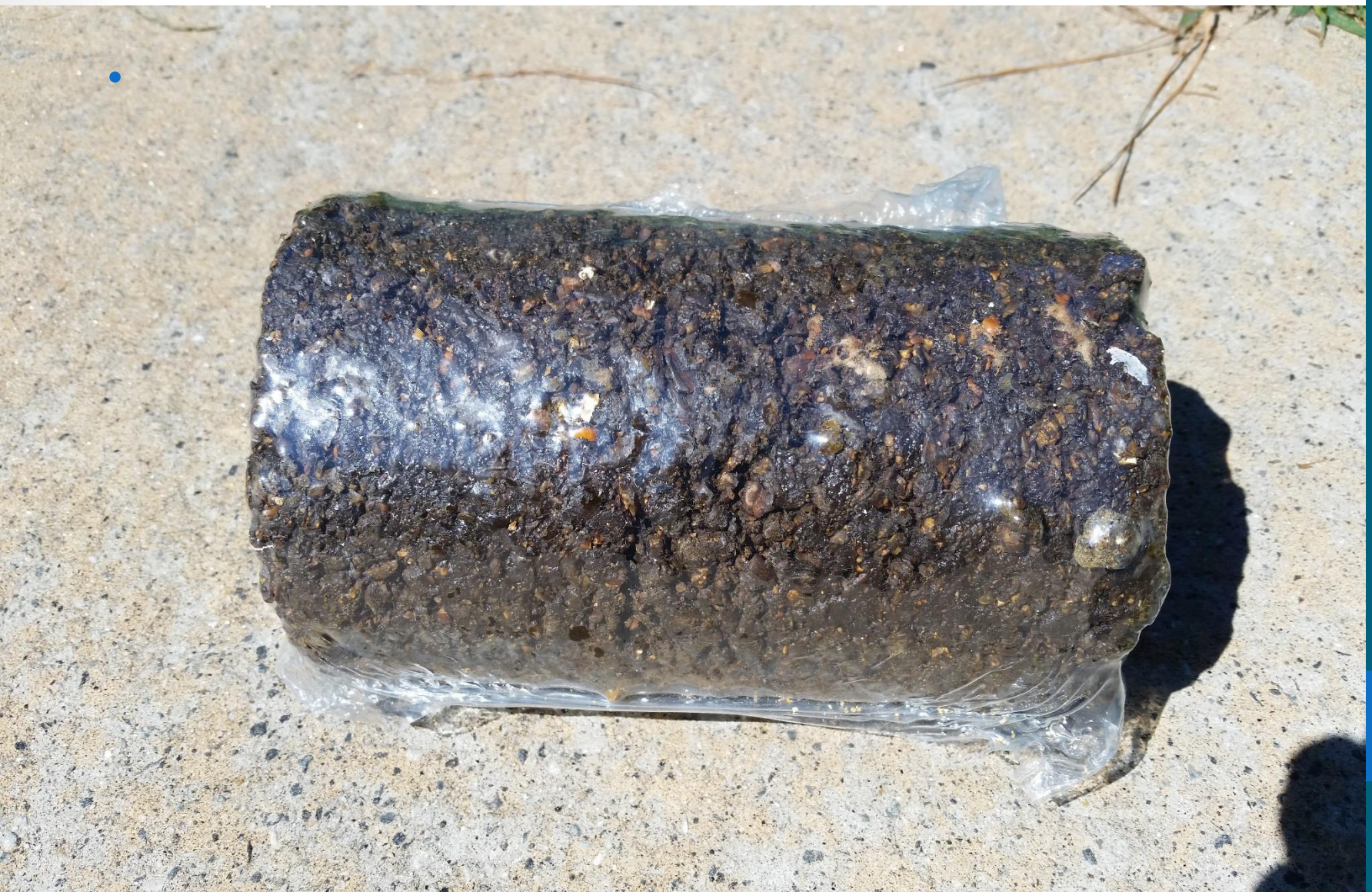
- Sample/Extra Small Bag 8”x12”
- Small Bag 8”x39”
- Medium Bag 12”x39”
- Large Bag 24”x39”
- Extra Large Bag 2’x8’

- HabiTubes can be made to the size needed for the project.





Time Release Fish Food



HabiTubes

- A tool for aquatic habitat restoration.
- A Simple Design.
- All natural materials.
- Patented.

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