Bioengineering Project on Graham Creek

Completed by City Stream Watch and their amazing volunteers!

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Project Design

- In response to landowner concerns regarding an eroding shoreline on Graham Creek, the City of Ottawa and RVCA partnered to come up with an erosion control solution
- City Stream Watch and RVCA designed an erosion control solution that would meet site conditions
- The same type of bioengineering was completed farther upstream on Graham Creek and is establishing very well
- The design features:
  - Layers of soil wrapped in coir fabric and coconut matting to hold soil in to build a terraced shoreline
  - Live cuttings and potted shrubs (native dogwoods and willows) were placed between each layer that will establish themselves and hold the bank in place
  - A fascine at the base of the soil lifts were built and installed to help slow water velocities
  - Native shrubs were planted at the top of the bank to help stabilize the disturbed area and infiltrate sheet flow coming from the slope above

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What is Bioengineering?

- Bioengineering is an erosion control method that combines engineering with ecological function (designed to mimic what nature already does)
- Bioengineering is an old science and has been used since the year 28 B.C.
- Bioengineering techniques use specific plant species; plants such as willows and dogwoods are used to create structures that form large root masses to stabilize soil
- Fascines are a type of bioengineering and are long, tubular structures, built from overlaying live cuttings of willows and dogwoods and are installed horizontally along the shoreline or vertically to help mitigate gully erosion

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How does bioengineering stabilize the shorelines?

- Exposed vegetation (stalks, stems, branches, and foliage) increases roughness on the bank, which helps create resistance to water flow and reduce immediate water velocities, causing the flow to dissipate its energy against the plant structure instead of the soil.

- Root systems hold soil together and increase overall bank stability due to its dense root structure

- Vegetation acts as a buffer against the abrasive effect of transported materials.

- Dense vegetation can cause sediment deposition by slowing velocity which allows coarser sediments carried by the flow to fall out and deposit.

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Benefits of Bioengineering

- Provides riparian function; riparian areas are the transition zones between aquatic and terrestrial ecosystems and are crucial to stream health
- Aesthetic benefits
- Improved habitat values (nesting, shelter, food, nutrients)
- Improved water quality (filters contaminants, uptake of phosphorus)
- Can be used on steep or sensitive slopes, where access is limited and heavy machinery cannot be brought in
- Plants can repair themselves and are flexible, unlike harder structures
- Structural benefits
  - Roots protect soil
  - Intercepts high water velocities and helps to dissipate flow energy
  - Improves water infiltration

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Project Details

- Material was harvested by with staff and volunteers on Friday from a hydro easement, in partnership with Hydro One
- Volunteers harvested two pick-up trucks worth of red osier dogwood and willows (mainly dogwoods)
- Machinery was used on Saturday to excavate and build the soil layers; volunteers were on-site to help wrap the soil layers, cut material and prepare and build brush layers
- More volunteers helped on Sunday to build the fascine and plant at the top of the slope

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Harvesting Material

Harvesting Material

“Before” Photo

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Site Preparation

Pump to carry water from isolated work area up the slope and into a silt bag which filters the water and holds the sediment

Isolated work site to prevent sediment from flowing into the stream

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Site Preparation

Staff cutting coir fabric
Soil is wrapped with two types of material:
-inner wrap is coconut matting to hold in fine material (silts, clays, sand)
-outer wrap is coir fabric that has same structural capacity as riprap

Machinery digging out base of bank to install first layer

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Installing First Brush Layer

After bank is dug, willows and dogwoods are laid along bottom

After willows and dogwoods are laid, the wrapping materials are laid down and filled with soil

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Wrapping First Layer

Second Layer

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Second Layer

Third Layer

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Third Layer

Soil Transfer and Fourth Layer

Soil lift installations are complete by the end of Saturday

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Building the Fascine

Dogwoods and some willow are overlapped to form a tight, tubular bundle

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Tying the Fascine

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Tying the Fascine

Final Fascine Product

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Fascine Installation

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Planting the Shoreline

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Project Complete!

Upstream view

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Downstream view

A TOTAL OF 28 VOLUNTEERS SPENT 121 HOURS ON THIS PROJECT--

We would like to offer a huge thank you for your help; we couldn't have done it without your!

We would also like to thank:

- Jamie Davidson Ltd. and his contractors for their wonderful work and humour
- Bruce Froats from Hydro One for arranging a harvest site for our live cuttings, helping us harvest and being a great photographer!

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For further information

This project was a collaboration between the City of Ottawa, private landowners and Rideau Valley Conservation Authority. For more information on the project, contact:

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