Sweepers

Description

A fallen cedar tree, partially submerged in water, provides an abundance of nooks and crannies for aquatic insects. Natural sweepers are common in the upper reaches of Ontario rivers like the Sydenham, Saugeen, Nottawasaga and Credit. The branches collect twigs and needles amongst other pieces of organic debris which add to habitat complexity. The greater the number of branches, the greater the accumulation of debris. These secluded spaces provide cover for juvenile fish and a wealth of insect forage for them. Once colonized with a bounty of life, larger fish are attracted to the prospect of engulfing an unsuspecting minnow. The sweeper, sometimes referred to as a submerged brush shelter, is used to mimic this natural habitat by introducing a thick mass of instream cover in the form of an entire tree, crown or large branches.

Purpose

Sweepers are used to attract juvenile fish by providing dense cover and food in the form of aquatic organisms. Cut locally and cabled in place, they can be used to create nursery cover where it is limited and deflect bank erosion. Eastern white cedar or hemlock are the proven species for durability and longevity although white spruce can be used with less confidence in surviving several years. In contrast with other woody cover structures, sweepers tend to be most suited for streams that have high flows, serious sediment movement, or potential for ice damage.

Application

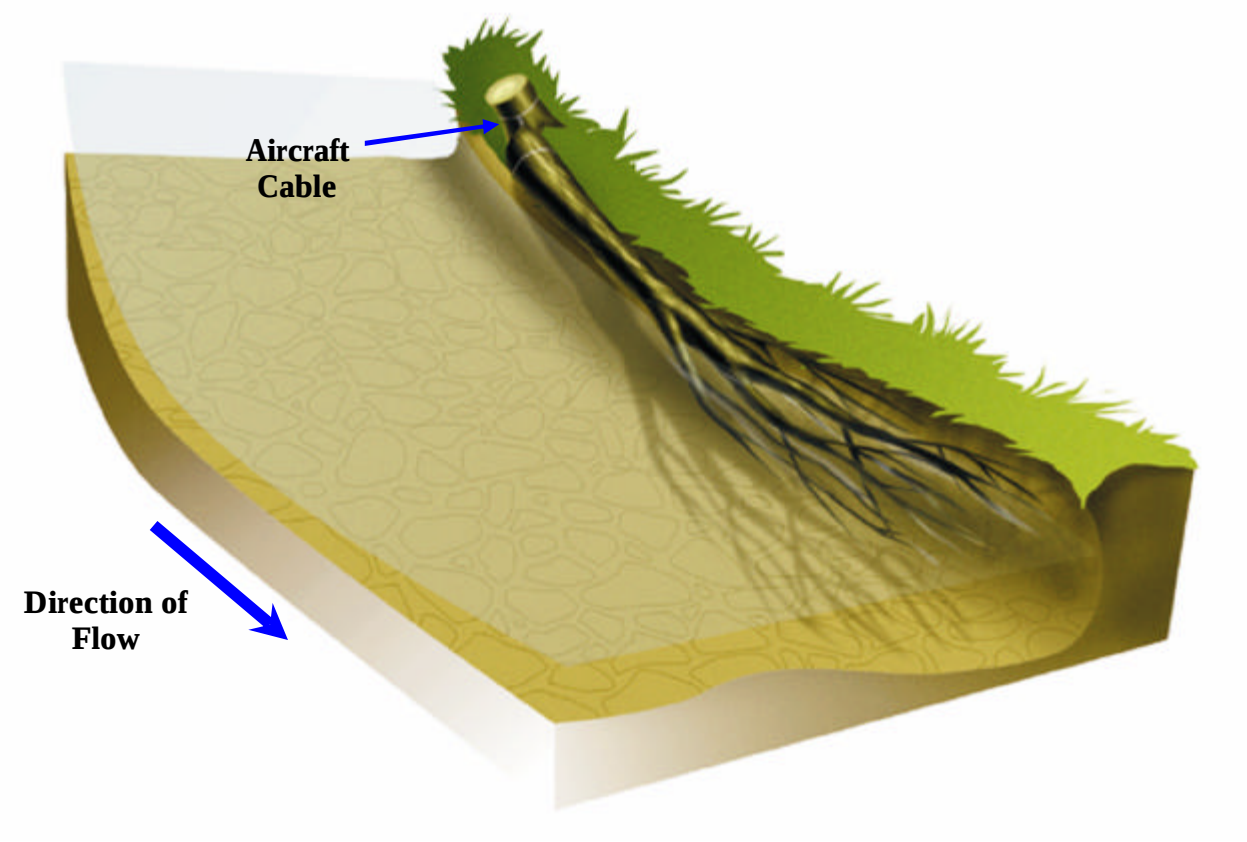
There is a great deal more flexibility in the application of this type of cover structure when we consider location and channel characteristics. Sweepers are well suited to a variety of streams and rivers that exhibit fluctuating water levels, inherent ice accumulation and moderate bedload. Target reaches have sparse cover. They can be placed on the outside of a meander or along a straight section of channel. A single point of attachment to the bank allows the sweeper to move up and down with the flow while deflecting the erosive energy of the water away from the bank.

Having determined your basic knowledge of the physical characteristics within a reach of stream, determining suitability and placement is relatively easy. These structures work equally well in meanders or straight sections. In watercourses containing bedrock, cobble, gravel, sand or silt/clay base as the dominant substrate combined with slopes less than 4% and light to moderate bedload, sweepers are well suited in straight reaches. The meanders within B, C, E and F channels composed of substrates of bedrock, cobble or silt/clay are where placement should be focused along the outside of a bend.

Construction Guidelines

Sweepers are natural and inexpensive habitat enhancements that are anchored to the bank of the

river using steel posts and aircraft cable or simply cabled to the stump from where it fell. Cedar or hemlock are the species which are most resilient to decay although hardwoods will also suffice. Sweepers should have at least a 15 to 40 cm butt diameter and 4.0 metres or more in length. More branches mean more cover and be sure to orient the tree in the current such that the branches trail downstream.



There are two ways of securing a sweeper. The hinged method involves selecting a tree that leans toward the edge of the river. Using a chainsaw, cut toward the river to the point where it starts to fall. Be sure to step back well away from the tree at this point. As it falls, the remaining uncut section will act as a hinge and secure the tree to the stump. Wrapping and securing aircraft cable to the stump and tree will provide additional strength.

In the second method, a previously cut tree is dragged to the site. Using a 1.5 cm diameter wood auger, drill a hole through the trunk at least 20 cm from the thickest end. Insert a 3.0 metre long piece of aircraft cable through the hole, around the trunk and back through the other end of the hole. Be careful to leave a 10 cm section for the crimp to the main cable. Using the crimping tool, fasten them together and fix the wrapped section of cable to the trunk with the fence staples. You should have 1-1.5 m of cable leftover. The anchor should be secured to the bank between the low flow and bankfull elevations. This prevents the sweeper from being deposited outside of the bankfull channel after a flood. Pound the 2.0 metre T bar post into the bank at a slight angle upstream. A 10 cm section of post with a pre-drilled 0.6 cm diameter hole located 5 cm from the top should remain for cable attachment. Drag the sweeper into position and carefully insert cable

through the hole in the anchor, just enough to loop around and crimp. There should be 0.5 - 1.0 metre of cable between the T bar post and the butt of the sweeper. Once released, it should float freely in the current.

Materials

You will need the following tools for installing sweepers:

- sledge hammer and post pounder
- chainsaw and personal safety gear
- drill with 1.5 cm auger bit, at least 30 cm long
- 3.0 metres of 0.3 cm diameter stainless steel aircraft cable
- matching 0.3 cm diameter crimps or clamps
- crimping tool or cable cutting tool and pliers
- cedar, hemlock or hardwood trees at least 4.0 metres long, 15-40 cm diameter with dense branches
- 2.0 metre T bar post
- hammer and 3.5 cm fencing staples

Cost and Maintenance Needs

Sweepers are a natural and cost-effective technique that can be easily installed by a crew of two in an hour. Cost is less than $15.00 per unit. The expected life of the structure is 3 to 5 years provided the recommended type of wood is used. Expect the submerged portion of the sweeper to become waterlogged in time. Frequent monitoring is needed to ensure proper installation and continued function.

Integration

Sweepers can be integrated into other stream rehabilitation projects such as:

- cabled log jams
- native material bank revetments
- live crib walls
- L.U.N.K.E.R.S.
- log cover

Demonstrations

This type of habitat structure has been applied in the following demonstration projects:

- Project #14, Bighead River Demonstration Project
- Project #91, Tioga Wildlife Area - Pine River
- Project #94, Martin Property - MacIntyre Creek

- Project #104, Collingwood Shipyards - CSL Property
- Project #109, Morningside Tributary Aquatic Habitat Rehabilitation Project
- Project #113, Harvey Brown's
- Project #117, Harding Property
- Project #123, Rocky Saugeen Silt Spill Rehabilitation Project

For More Information

Please refer to the following authors and their respective publications located in the bibliography:

Buchanan, R. A. , D. A. Scruton and T. C. Anderson 1989
Forder, D. R. et al, 1997
Rosgen, D. 1996