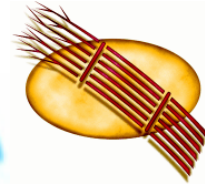


Live Cribwall



Description

A live cribwall is a three dimensional structure created from untreated timbers, fill, and live cuttings. This structure, once filled, acts as a retaining wall. The timbers provide immediate protection and stability for the structure, but their importance is gradually lessened as they decompose, and the live cuttings grow and proliferate. The resulting root mass binds the fill and the parent soils into a single coherent mass. Live cribwalls are also one of the more complex structures listed in this manual, as their construction can cause considerable site disturbance.

Purpose

Live cribwalls can be used to perform a wide variety of functions. They can be used instead of a structural treatment (such as gabions or concrete blocks) where the natural appearance and habitat features are important. Live cribwalls are also helpful in reducing the grade of a slope by stabilizing the toe and protecting it against undercutting. This feature is especially important if you are faced with a site where grading the bank to a flatter and more stable angle is not an option.

Application

When used to protect streambanks, live cribwalls should not be placed in areas that experience large, lateral earth stresses or mass wasting. Live cribwalls constructed from untreated timbers should also be built with a maximum height of 3m. If the site requires a cribwall higher than 3m, treated timbers, or rot resistant timbers, such as cedar, may be required. A structure this high may also need the expertise of an engineer.

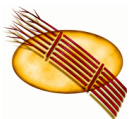
There is a considerable amount of fill needed for its construction. Therefore, live cribwalls require the use of heavy equipment, making this method unsuitable if machinery access is impossible. The foundation of the cribwall should be excavated into the streambed just below the deepest part of the streambed. Care should also be taken to align both the upstream and downstream ends of the cribwall into the streambank.

Heavy equipment is typically required for the excavation of a footing into a streambed. Therefore, it is recommended that those interested in constructing a cribwall contact their local Conservation Authority and Ministry of Natural Resources District office. There will be concerns with sedimentation, timing, and the impact of the machinery on the stream.

Construction Guidelines

To build a live cribwall, follow this sequence of construction steps:

- Harvest and stockpile an assortment of live, dormant cuttings. The live cuttings should be the same form and species as used in brushlayers. Slim, relatively unbranched cuttings (coppice), work best because they are the easiest to manipulate and they produce the densest brushlayers. If the cuttings have multiple, hard to bend side branches, prune them. The cuttings should not be shorter than the depth of the cribwall plus 1/4.
- Excavate the footing of the cribwall; making sure the base is below the streambed (figure) and that it is angled into the streambank so that the cribwall will have a batter of at least 15%.
- If working in a de-watered site, place the first course of logs or timbers at the front and back of the excavation (parallel to the streambank). Place the next course at right angles, on top of the other timbers (perpendicular to the streambank). Nail timbers together. If working in the water, the submerged portion of the cribwall can be constructed in sections in the dry and lowered into place.
- Fill the submerged portion of the cribwall with the rock fill, taking care to place conifer boughs or brush into the openings in the face of the cribwall. These cuttings provide a rough surface to the cribwall, creating instream habitat, and protection by forcing the current away from the cribwall. This "dead" brush should protrude 0.5 m - 1 m into the stream, and extend from the footing, just below the baseflow level of the stream.
- The portion of the cribwall that is above water is a combination of timbers and brushlayers. The brushlayer is placed on the cribfill, perpendicular to the streambank. The brushlayer should be constructed following the same procedures as listed in the *Brushlayers Factsheet*. If possible, soils from the site should be used in the construction of the live portion of the cribwall. If faced with saturated, contaminated, or rocky soils, you may need to import soil. The brushlayer is placed with the cut ends touching the back of the excavation, and the growing tips pointing out over the stream. The brushlayer should be as thick as the height of the timbers placed perpendicular to the streambank. The finished brushlayer will be flush with the top of this timber. If using fertilizer, sprinkle it sparingly throughout the brushlayer. Cuttings should be placed liberally, and the brushlayer should be dense to reduce the washing out of the soil.
- The brushlayers should run uninterrupted (except for the ends of the perpendicular logs) along the entire length of the cribwall. Care should be taken to ensure that the **batter** of the cribwall is maintained throughout each course. This is to provide enhanced stability to the cribwall, and to ensure that the brushlayers are also placed at the proper angle.
- Place the next course of parallel logs onto the cribwall, fasten, and fill with soil to the top



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edge of these logs. This is the fill layer.

- Place the next brushlayer, then the next fill layer, and so on until the desired height is reached. The top of the cribwall should reach the bankfull or high water mark.

Materials

Here's a list of what you will need:

- timbers such as eastern white cedar, red pine, jack pine or spruce. Timbers that are straight, with a relatively uniform diameter work best. In cribwalls less than 3m, wood rot resistance is not as important as straightness or uniformity of diameter. Timbers should have a minimum diameter of 15cm.
- ample quantities of live cuttings. For example: a 30m long cribwall 1.5m high, with 3 brushlayers will use approximately 160 bundles of cuttings (bundles being 20-30cm in diameter, and 2m long).

Recommended species:

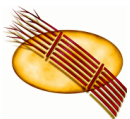
Small streams - Heartleaf willow, Sandbar willow, Shining willow, Pussy willow, all of the dogwoods.

Large streams - Black willow, Peachleaf willow, Pussy willow, Sandbar willow, Heartleaf willow, Carolina poplar, Balsam poplar, all of the dogwoods.

- shovels, rakes, deadblow and sledge hammers, pruning shears, utility knife, chainsaw and appropriate safety equipment, measuring tape, level.
- ardox spikes, length to be 2x the diameter of the timbers.
- pit run gravel, gabion stone, or rock for filling the submerged portion of the cribwall, rock should be unsorted, sizes from 2 - 10 cm in diameter.
- evergreen boughs, or (if not easily available), brush, sticks, or tips from trimmed willow bundles.
- 7-7-7 granular fertilizer.
- backhoe/or highhoe.
- sediment curtain, if excavating the cribwall footing into the streambed.

Cost and Maintenance Needs

Live cribwalls can be costly to construct. The use of timbers, imported rock fill, and the use of earth moving machinery to prepare the site and construct the wall make this one of the more expensive techniques listed in this manual. Costs can range from \$100 - \$400/linear meter completed. Once the live cribwall is growing, it should require little maintenance.



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Integration

Live cribwalls can be easily integrated into many types of projects such as:

- brush mattresses
- live stakes
- fascines
- L.U.N.K.E.R.S.
- Sweepers

Demonstrations

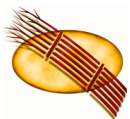
This type of habitat structure has been applied in the following demonstration projects:

- Project #15, Black Ash Creek Rehabilitation Project
- Project #24, Brault Property
- Project #47, Schneider Creek
- Project #58, Larches Creek
- Project #64, Highland Creek Rehabilitation Project - Markham Branch
- Project #67, East Humber River Rehabilitation Project
- Project #80, Williamsburg Community Biotechnical Works
- Project #93, Glen Huron - Mad River
- Project #135, Halls Creek

For more information

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

Gray and Sotir, 1996
Schiechtl and Stern, 1996
210-EFH, 1992
Schiechtl, 1980



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