



Tree Revetments

Tree revetments are cut trees anchored at the bottom (or toe) of unstable streambanks. These anchored trees serve to slow the current along the bank, decreasing erosion and allowing sediment to be deposited within the tree branches. Trees with many fine limbs and branches are best at slowing near-bank currents, catching sediment carried in the stream, and catching slump material from the bank. For this reason, eastern redcedar is usually the best choice. Eastern redcedar is also more resistant to decay than hardwood trees.

The sediment trapped in and behind revetments provides a moist, fertile seedbed for vegetation establishment. The primary purpose of a revetment is to stabilize the bank until trees and shrubs become established to provide permanent protection (Figure 1).

Designing a Tree Revetment

The majority of tree revetments are installed on the outside bends of small to medium streams that are unstable because the riparian vegetation has been removed.

Some streambanks become unstable because of past alterations to the channel or watershed. A good



Figure 1. Cedar revetment and willow stakes after 3 months.

example of this would be stream straightening (or channelization). One indication of this situation is when a streambank is covered with trees and vegetation and is still eroding. If that is the case, a tree revetment may not work. Characteristics such as stream size, bank height, and flow fluctuations should be considered when deciding if a revetment is an appropriate practice for your site. Single-row tree revetments may not be effective on extremely high banks or on large river systems.

Tree revetments should begin and end at points on the streambank that are not eroding. If a revetment does not run the entire length of an eroding bank, the structure may be ineffective and possibly

increase bank erosion. It is extremely important to anchor each tree in the revetment at the base or toe of the eroding bank. This is the point of the bank where the vertical bank meets the horizontal bottom (Figure 2). If the trees are anchored too high on the bank, the water may undercut the structure. If they are placed out in the channel too far, the current will continue to erode the bank behind the revetment.

Another consideration is the soil type and texture that the anchors will be driven into. Sandy or rocky soils will usually require a larger anchor driven to a greater depth while smaller anchors may be used in heavier clay soils. The four typical anchor types are arrowhead anchors, duckbill anchors, disc anchors, and steel fenceposts.

Since every stream is unique, consult a natural resource profes-

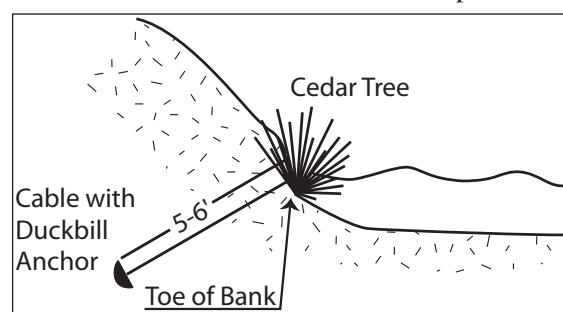


Figure 2. Cross section of tree revetment showing cedar placement of the toe of the bank.

sional to determine if a tree revetment is the appropriate solution to the problem. Before doing any work in a stream, contact the U.S. Army Corps of Engineers and the Kansas Division of Water Resources to see if a permit is required.

Installing a Tree Revetment

Revetments can be installed during any season, but late winter and early spring are usually the best times. Cedar trees placed in early summer can dry out and lose their needles before being flooded. They are most effective at trapping silt and sand if flooded while still green and succulent. Timing is not so important when hardwood trees are used. Larger trees are usually your best choice for revetments, because they will protect more of the bank. Cedar trees 15 to 20 feet tall are an excellent choice for revetments. Remember that a revetment should not make the stream channel significantly narrower. Generally, a revetment won't cause problems if all trees are anchored tightly against the eroding bank.

Begin construction of the revetment at the downstream end of the eroding streambank. Place the first tree at the top of the eroding bank, with the cut end of the tree pointing upstream. Drive the anchor, with about 12 feet of cable attached,

into the toe of the bank where the top portion of the first tree will be located. Roll the tree into the stream and position it at the toe of the bank. While holding the tree tightly against the bank, attach the cable to the top of the tree using a cable clamp. Mark the bank where the second anchor will be placed to hold the butt end and drive in the anchor. Reposition the butt end of the tree tightly against the bank and attach it to the anchor. Anchoring the trees tightly against the bank is crucial. Move the next tree into place with its top overlapping the butt of the first tree, making sure to not leave any gaps between the trees. Secure the cable used to anchor the butt of the first tree to the top of the second tree. Drive and attach a new anchor at the butt end of the second tree. Continue the process upstream until the entire bank is covered with trees.

After construction of the tree revetment, make a visual inspection to make sure no gaps are left between trees or between the trees and the bank. Fill gaps with small cedar trees cabled to the larger ones already in place. Inspect revetments after floods and repair any breaks before the breaks become larger.

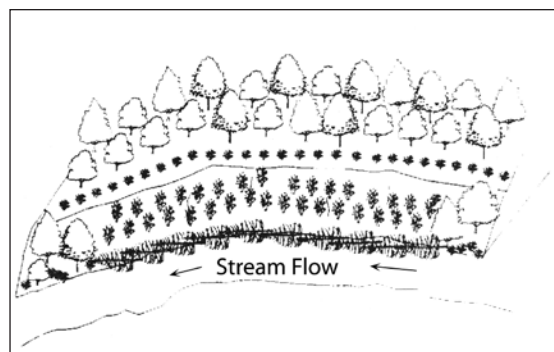


Figure 3. Design plan for revetment with willow cuttings and a riparian buffer.

Over time, the vertical bank will attain a more gradual slope as it slumps and the slump material is caught and held by the revetment. This is an essential step in the establishment of vegetation and long-term stability. You can aid the revegetation process by planting trees and shrubs and placing willow stakes on the streambank (Figure 3).

For additional information on tree revetments, cost-share opportunities or technical assistance, contact the Kansas Forest Service, your local conservation district office, K-State Research and Extension office, Natural Resources Conservation Service office, or the Kansas Department of Wildlife and Parks.

References

Tree Revetments for Streambank Stabilization. Missouri Department of Conservation.



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