

BANK RE-VEGETATION For Agricultural Land

Note: The Riparian Management Field Workbook, a companion document to this Drainage Management Guide, provides additional information on plant selection, planting techniques and management of riparian areas.

Re-vegetating the banks and land adjacent to a watercourse can reduce erosion and stabilize stream banks. If there is no streamside vegetation, planting the bank is often the most cost effective stabilization technique. Plant roots help to hold the bank material together while above ground stems slow water velocities, break up overland flow and trap sediment.



Figure 1 Vegetated Bank

Bank stabilization using 'soft' engineering techniques such as planting and/or seeding, may be undertaken at any time of year without notification or approval.

Objectives of Bank Re-vegetation

There may be many objectives and goals that bank re-vegetation is to meet. The functions of a vegetation bank may also be changed depending on the types of plants chosen for bank re-vegetation.

Desired functions may be:

- To protect the stream bank against erosion - short and long term.

- To provide access to sediment traps for clean-out (primarily from north side of the stream).
- To prevent the invasion of noxious weeds.
- To reduce the negative impact of weeds growing in the channel - short and long term.
- The development of shade from shrubs and trees reduces the heating of stream water due to direct sunlight through.
- To dissipate concentrated overland flow, filter sediment and increase infiltration away from the stream.
- To provide other fish habitat benefits – leaf litter, small woody debris and terrestrial insects dropping into the water; cover from vegetation where possible.
- To produce marketable products that will have beneficial or no effect on fish habitat.
- To develop the riparian area into an integral part of the agro-ecosystem rather than a strip of unmanaged land producing undesirable impacts on the farming operations of landowners.

It is important that the planting develops into a stable ecosystem that once established will require minimal maintenance.

Advantages of Bank Re-vegetation

Visual - Riparian vegetation is esthetically attractive improving the farm environment.

Water quality – flooding or heavy rainfall can cause concentrated overland flow that will carry silt and other materials. The above ground part of vegetation will break up concentrated flow, trap and filter out

sediment before it reaches the open ditch and increase infiltration of water. Roots of vegetation can absorb nutrients and other compounds from the infiltrated water.

Fish Habitat – if the ditch is fish bearing the improvements in fish habitat are direct; they are indirect if it is not fish bearing but flows into a water course that is fish bearing.

Shade - Shrubs and trees growing on or at the top of the bank will in time produce dense shade. Shade on water reduces the heating effect of direct sunlight improving fish habitat. Shade reduces growth of undesirable vegetation in ditches and on ditch banks that may restrict water flow.

Food - Vegetation supplies food to fish directly in the form of insects that fall into the water and indirectly in the form of leaf litter and other organic matter that feeds invertebrates that are in turn feed for fish.

Low Cost – Ditch bank planting is a relatively inexpensive technique for bank stabilization. The plants can be installed relatively quickly with minimum of labour.

Increased Bio-diversity – vegetation planted along ditch banks increases the range of plant and animals (organisms that live in or on the vegetation). This is a good thing as long as the increased bio-diversity does not interfere with farm operations.

Disadvantages of Bank Re-vegetation

Weeds – Planting must be managed to prevent noxious weeds from becoming established. Species to be planted must be carefully selected to not include a weedy species that will become a problem in nearby fields.

Insects and Plant Diseases – Select species for planting that are not a host to problem insects and plant diseases that may spread to nearby crops.

Birds – One of the primary concerns landowners express about planting of trees and shrubs is an increase in the local bird population. Some people may see this as good for bio-diversity or insect control reasons. Berry, tree fruit and corn producers do not want to do anything that will increase the number of birds that may feed on their crops.

Rodents and Ungulates – voles, mice, beaver, pocket gophers and Columbia ground squirrels are all major rodent problems that can become a problem with increased vegetation along a ditch. Ungulates such as deer, elk and moose may use the cover of vegetation planted along the ditch to move into a farm property.

Other animals and people – predators such as coyotes can use vegetation along ditches as cover. Vegetation can also provide cover for people entering the on the farm property without knowledge of the landowner.

Technical Considerations

The bank slope should be no steeper than 2H:1V (2 horizontal lengths for 1 vertical length) for planting. If soils are fine silts and sands and planting is the only stabilization technique being used, lower slopes of 3H:1V to 4H:1V are more appropriate.

Plantings are most successful on banks where moderate erosion is anticipated and the bank is not actively slumping. If slope failure is extensive or there is erosion at the toes of the bank, planting vegetation on the bank will not solve the problem. In these situations another technique of bank stabilization should be used in conjunction with the streamside planting.

Planting should take place in original soil not in fill. Fill areas should use bio-engineering to stabilize the disturbed soil.

Woody plant material takes time to produce enough root and stem growth to stabilize and protect the bank. Seeding grass or grass and clover mixtures will provide faster green cover till the woody material becomes established. It may be necessary to use interim non-plant protection measures, such as biodegradable or synthetic geotextiles, crib walls or riprap. Vegetation cover alone may not protect the bank from high velocity flows.

Plant Selection

Effective erosion control programs use a mix of plant species to incorporate structural diversity along the bank. Plants should be selected which grow under the conditions where they will be planted and are capable of performing a specific function.

Functions such as quick growth, strong roots to resist erosion, ability to produce shade, production of berries for birds (or no berry production for no birds) and ability to produce a marketable crop.

For all methods described below, it is important to get expert advice on the types of plant species that will survive in specific conditions and the initial planting and maintenance required to ensure the planting will thrive.

When to Plant

Ideally planting should be done in the spring or late fall. Planting can be done at other times of the year, however, plant survival is likely to be lower. Adequate moisture must be supplied to the plants throughout the growing season, particularly if unrooted cuttings have been used. Various types of mulches can be used to preserve moisture and reduce weed competition but they may also suppress natural regeneration of growth of desired plants. Mulches should only be used when recommended by a professional.

Live Staking

Cuttings from woody plants are often readily available and easy to install, this is referred to as 'live-staking'. Live staking is used in many bio-engineering practices to stabilize soil or stake other materials in place. The plant's roots stabilize the bank by binding soil particles together and removing moisture from the soil.

The best time for stake installation and harvesting depends on the plant material. Get professional advice on plant material.

Wood should be stored full length (as it was harvested) and re cut just before planting. Ideally cuttings should be planted as soon after collection as possible. If the cuttings are to be stored they should be kept moist and stored at low temperature (-1° C to -4° C).

Live staking does not immediately provide slope stabilization, it takes a couple of years for the plants to become established. Plantings on moist, well drained banks that are not subject directly to erosive forces will be most successful. Seeding will provide protection to the exposed soil. The stakes in Figure 2 also have plastic tubing around the base to protect the plantings from rodents.



Figure 2 Live Staking

Monitoring

Plantings should be monitored throughout the growing season to make sure the plants are doing well. Soil moisture may be dependent on the depth to the water table; soils may dry out during low water in mid summer.

Frequent causes of planting failures are weed competition, drought, browsing by small and large animals and incorrect plant selection for the site.

Installation of Live Stakes

The stake should be no smaller than the diameter of a thumb or index finger, 1.5-4.0 cm, and 60-90cm long. Be sure to protect the plant material from drying out between the harvesting and planting.

Install the stakes in a triangular pattern about 2-4 stakes per square meter. Actual spacing will depend on the plant type and eventual size of the plant.

Recut harvested wood to 30 – 45 cm cuttings ready to plant. Cut the bottom of the cutting at a 45° angle and always plant the angle down. Push the stake in by hand or tap it in gently with a soft mallet until 4/5th of the stake is below the ground. If the soil is very hard use a probe to make a pilot hole.

Presoaking cuttings 24 to 72 hours before planting has shown to increase plant survival rates. However, soaking also softens the wood. To prevent damage to the cutting a probe should be used to create a pilot hole. The pilot hole should be slightly smaller than the diameter of the cutting to ensure good soil-plant contact. If the hole is larger than the cutting pour a slurry of water and native soil into the hole with the cutting. In all cases tramp the soil around the base of the planted cutting with your boot to collapse any air pockets near the cutting. Irrigate after planting if possible

Container or Root Stock Planting

Container grown and bare root stock can be purchased from nurseries or transplanted from areas away from the slope. Pre-rooted plant material can offer a faster but more expensive solution to some slope stabilization projects than live staking. It is often used when rapid root establishment is required.

Planting of Container or Bare Root Stock

Loosen the root balls before placing the plants in pre-dug holes. The plants should be monitored and irrigated until the root system is well established. Planting is best in the spring.

Seeding

Seeding with grass and clover creates a shallow root zone in the first foot of soil. This protects the soil surface from surface runoff and wind. Seeding is usually used in conjunction with other planting techniques and is intended to provide temporary erosion control. Some grass species will provide very rapid green cover if required.

However, grass can be very competitive with the woody species, so needs to be controlled in the area around the planted shrubs or trees.

Woody vegetation provides stronger bank protection against slumping.

For best results a custom seed mixture for the site and the season is recommended. Fertilizers may also be recommended for certain soil conditions.

Seeding Methods

Seeding can be done by hand or by hiring a contractor to hydro-seed the site. Hydro seeding involves spraying a combination of seed fertilizer in a slurry mixture.

If the soil is dry and precipitation isn't anticipated in the near future the area should also be irrigated to initiate germination.



Figure 3 Recently Seeded Bank

Streamside Fencing

Streamside fencing should be considered in conjunction with bank re-vegetation in areas where there is presently unrestricted access by animals or people. The fencing will prevent animals from disturbing the newly planted vegetation and allow the plants to become established.

Provision of constructed livestock watering holes adjacent to the stream rather than in the stream itself helps to protect other stream resources, such as fish. Check with MAFF for assistance with streamside fencing/livestock watering hole projects.



Figure 4 Fence on a Recently Hydro-seeded Channel

Contact Information

Agency Contacts, Factsheet No. 19 in this series, contains a list of local agency contacts and other organizations that may be able to provide some assistance.