What is it?
Watercourse re-vegetation is the removal of noxious weeds and planting of native trees and shrubs on the banks and land adjacent to watercourses.

Why is it called re-vegetation?
Most watercourses had native vegetation growing on their streambanks at one time. Vegetation was often removed thinking that improved drainage would result. The long term result, however, has been poor drainage due to the growth of invasive Reed canarygrass. Re-vegetating the streambanks with native trees and shrubs will recreate shade and inhibit the growth of invasive grasses.

Maintenance activities such as dredging kill fish and remove habitat features that fish require for survival. State law requires that a Hydraulic Project Approval (HPA) application be denied when, in the judgment of the WA Department of Fish & Wildlife, the project will result in direct or indirect harm to fish life unless adequate mitigation can be assured by conditioning the HPA or by modifying the proposal (WAC 220.110.30). Further, dredging projects shall incorporate mitigation measures as necessary to achieve no-net-loss of productive capacity of fish and shellfish habitat (WAC 220.110.130). The requirement for mitigation does not include irrigation ditches, canals, storm water run-off devices, or other entirely artificial watercourses, except where they exist in a natural watercourse that has been altered by humans (WAC 220-110-020(83)).

Why do it?
Historically Drainage Improvement Districts (DID) and many landowners have had a scorched earth policy of removing all vegetation from the banks of watercourses. Trees and shrubs can get in the way of maintenance equipment. Trees and shrubs are also materials that beavers use to dam up the watercourse and flood farmland. In light of these perceived disadvantages, why have 26 miles of DID watercourses in Whatcom County been re-vegetated over the past four years with more planned in the future? Read on and you will find that there are significant advantages to re-vegetating the banks of watercourses.

Perhaps most important to landowners is that re-vegetating the banks and land adjacent to a watercourse can save money otherwise spent on dredging because the shade-providing and bank-stabilizing vegetation can lengthen the interval between channel cleaning. The roots and shoots stabilize stream banks and reduce erosion. If the dirt doesn’t get in the channel to begin with, then you don’t have to pay to get it out. Dense infestations of aquatic weeds, like Reed canarygrass, inhibit the flow of water. As the water flow slows, sediment falls out and is deposited in the channel. The shade created by trees and shrubs suppresses the growth of grass and helps keep the water flowing.
Native trees and shrubs mitigate against negative impacts to fish and fish habitat by:

- Protecting the stream bank against erosion.
- Preventing the invasion of noxious weeds.
- Reducing the negative impact of weeds growing in the channel - short and long term.
- Providing shade, thereby reducing water temperature otherwise heated due to direct exposure to sunlight.
- Dissipating concentrated overland flow, filtering sediment, and increasing infiltration in the planted corridor area adjacent to stream.
- Providing other fish habitat benefits – leaf litter, small woody debris, terrestrial insects dropping into the water and cover from vegetation where possible.
- Integrating the riparian area into a functional part of the agro-ecosystem, rather than a strip of unmanaged land producing undesirable impacts on the farming operations of landowners.

**Other advantages to Bank Re-vegetation include:**

**Visual** – Riparian vegetation increases the attractiveness of the farm environment by contributing blooming plants, fall colors, and a visual distinction between fields. A hedgerow of native woody vegetation is much more attractive than the look of tall, dry, unmowed grass.

**Water Quality** – Flooding or heavy rainfall can cause concentrated overland flow that carries silt and other materials. The above ground part of vegetation breaks up concentrated flow and traps and filters out sediment before it reaches the open watercourse, thus increasing infiltration of water. Roots of vegetation can absorb nutrients and other compounds from the infiltrated water.

**Bank Stability** – Woody plants form a dense root mat in the soil, preventing bank erosion.

**Fish Habitat** – If the watercourse has fish in it, the improvements to fish habitat from riparian re-vegetation are direct. If the watercourse is not fish bearing but flows into a watercourse that is fish bearing, the benefits are indirect.

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

**Food** – Vegetation supplies food to fish both directly and indirectly. Insects falling into the water from the leaves are eaten by fish. Indirectly, vegetation provides leaf litter and other organic matter that is eaten by the insects that are in turn food for fish.

**Low Cost** – Watercourse bank planting is a relatively inexpensive technique for bank stabilization and required mitigation. The plants can be installed relatively quickly with a minimum amount of labor. Funding for this work can often be found from governmental agencies or non-profit groups.

**Increased Bio-diversity** – Native vegetation planted along ditch banks increases the range of plant and animal species (organisms that live in or on the vegetation) that can be found along the waterway. Native woody plants will primarily attract native bird species that do not adversely affect crops or livestock and may provide some benefit such as insect control.

**Disadvantages of Bank Re-vegetation**

**Weeds** – Planting must be managed to prevent noxious weeds from becoming established. A densely planted area is not vulnerable to weed infestation. However, if not mowed regularly, weeds may become established in the “edge” area between the planted bank and field.

**Insects and Plant Diseases** – Select native plant species because they usually do not host problem insects or plant diseases that may spread to nearby crops. Non-native plants tend to attract nuisance species such as European starlings.

**Birds** – Many landowners are concerned that planting trees and shrubs will increase the local bird population. While good for bio-diversity and insect control reasons, most 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. However, native plants tend to attract native song birds that do not cause problems. Non-native plants may attract non-native nuisance bird species such as European starlings that can have significant impacts to crops and livestock.

**Rodents and Ungulates** – Voles, mice, beaver, pocket gophers, and muskrats are all rodents that can become a problem with increased vegetation along a ditch. Ungulates such as deer and elk 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 watercourses as cover. Vegetation can also provide cover for people entering the farm property without knowledge of the landowner.
How to Re-vegetate a Bank

Technical Considerations

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

Plantings are most successful on banks where moderate erosion is anticipated and where the bank is not actively slumping. If slope failure is extensive or there is erosion at the toe 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. It is important that the planting develops into a stable ecosystem that will require minimal maintenance once established. 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 until the woody material becomes established. It may be necessary to use interim non-plant protection measures, such as biodegradable or synthetic geotextiles, or crib walls. Vegetation cover alone may not protect the bank from eroding in high velocity flows.

Plant Selection

Effective bank revegetation uses a mix of plant species to incorporate structural diversity along the bank. Plants should be selected based on their ability to grow under the conditions where they will be planted and on their capability to perform the desired function. Functions may include quick growth, strong roots to resist erosion, ability to produce shade, production of berries for birds (or no berry production for no birds) or the 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 requirements for planting techniques and maintenance 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 un-rooted cuttings have been used. Solid seedling protectors should be installed on each plant to protect the plant from rodent damage and to facilitate maintenance.

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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.

Installation of Live Stakes

The stake should be no smaller than the diameter of a thumb or index finger, 1/2” to 1 1/2”, and 36” long. Be sure to protect the cuttings from drying out between the harvesting and planting.

Install the stakes in a gridwork approximately 3’ on center. Actual spacing will depend on the plant type and eventual size of the plant.

Push the stake in by hand or tap it in gently with a soft mallet until two-thirds of the stake is below the ground. If the soil is very hard use a dibble tool or other type of 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. In order 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, press down the soil around the base of the planted cutting with your boot in order to collapse any air pockets near the cutting. Irrigate after planting if possible.

Willow livestakes planted for bank stabilization

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. WA Dept. of Ecology (WDOE) recommends the following seed mix for temporary erosion control:

- Chewings fescue or annual blue grass 40%
- Festuca rubra var. commutate or Poa annua
- Perennial rye 50%
- Lolium perenne
- Retop or colonial bentgrass 5%
- Agrostis alba or Agrostis tenuis 5%
- White dutch clover
- Trifolium repens

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 plants, as opposed to live staking, can offer a faster but more expensive solution to some slope stabilization projects. Many more species of plants are available as rooted than as live stakes.

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.

Hedgerow after one summer of growth

One season growth of seed mix planted in the spring