

Riparian FACTSHEET



Ministry of
Agriculture

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FACTORS TO CONSIDER WHEN PLANTING AGRICULTURAL RIPARIAN AREAS

Planting and maintaining agricultural riparian areas can be very beneficial for both the farm and for the watercourse. However, if those plantings fail to grow, these benefits are lost. This factsheet looks at some of the common problems associated with riparian plantings and provides suggestions for avoiding these common pitfalls.



When plantings fail, it results in frustration, wasted resources (labour, capital and plant materials) and lack of benefit to the watercourse.

Reasons Why Riparian Plantings Fail

Riparian areas represent special areas within the agricultural context. However, as with agricultural crops, riparian plantings require adequate light, moisture and nutrients and freedom from competition to thrive.

The most common causes of riparian planting failures are:

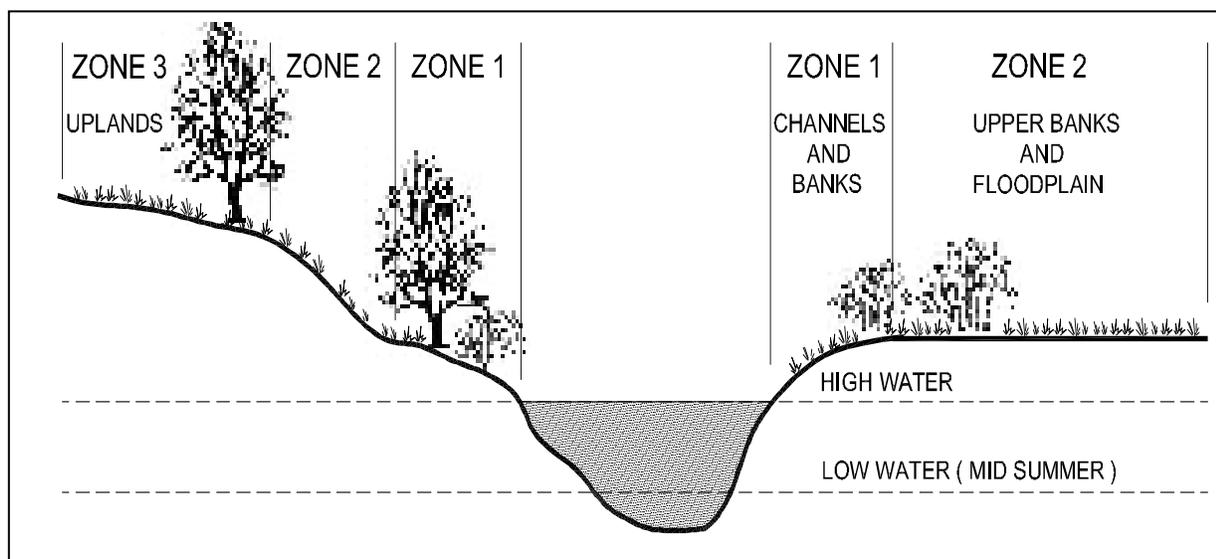
- inadequate summer moisture
- competition with weeds and/or other riparian plants for moisture, light and nutrients
- poor planting methods
- selection of inappropriate plant types
- poor planting design – trees and shrubs planted in the wrong location fail to achieve the desired functions

Good planning and planting methods, appropriate species selection and good post-planting maintenance should eliminate these concerns.

Factors That Should be Assessed Prior to Planting

Moisture Zones

Riparian areas are different from most farm-land areas in that:



General View of Riparian Moisture Zones

- the water table is close to the soil surface
- as the distance from the edge of the water increases the depth to the water table usually increases
- throughout the year the water table moves, responding to runoff (seasonal and storm events)
- the edge of the stream bank near the water is usually under water for part of the year (flooding)

Soils within the riparian zone will influence the extent to which the stream influences the depth to the water table. Sites with heavy clay soils will not be freely drained while sites with coarse granular soils (sands and gravels) will be freely draining. Within these parameters, the riparian area can be roughly divided into three identifiable zones based on the factors listed above:

Zone 1 – Edge of Water – This is a poorly drained area – the water table remains above 0.30 m depth for long periods of the growing season. This area is always moist or wet and may be under water for part of the year. Plants suitable for this zone either require or are able to tolerate wet or water filled soils and must be able to tolerate long periods of inundation (flooding). The width of this area is variable based on the topography of the area.

Zone 2 – Transition Zone – This area is well drained – the water table does not come within 0.30 m of the soil surface, or does so briefly, receding quickly to an average depth of 0.5 m after a storm event. Plants suitable for this zone must be able to tolerate short periods of flooding and soils that dry out mid summer.

Zone 3 – Upland Zone – This area is very well drained. It is dry for most of the year, the water table is rarely near the surface and it is not prone to flooding. Plants suitable for this zone need to be able to tolerate mid-summer dry soils. The factsheet titled *Selecting Plants for Agricultural Riparian Plantings*, (Factsheet No. 4) identifies plants that are suitable for each of these zones.

1. Existing Vegetation

Existing vegetation should be evaluated in preparation for planning the riparian planting. The issues of importance are:

- presence of invasive weeds and the extent of infestation

- thick stands of grass and other vegetation that will provide early, difficult to control competition for the trees, shrubs and forbs to be planted.
- established trees and shrubs that should be protected and retained as part of the riparian planting
- trees and shrubs may have to be removed for bank re-sloping or machine access to the watercourse for future cleanout (see the *Drainage Management Guide* for approval process for doing this type of work)
- areas without vegetation i.e. areas of bare soil

2. Bank Structure / Form

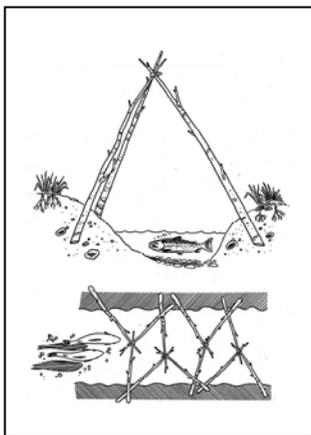
The structure or form of the stream bank in the area to be planted is very important to the success of the planting. If the stream banks are slumping, the slope of the bank may have to be modified prior to planting. Other bank stabilization methods such as soil bioengineering should also be considered. See *Drainage Management Guide* for more information.

3. Planting Design

Some aspects of the design of riparian plantings are critical to their success. The most important ones include:

- **Successional status** – Where streambanks are bare, planting early successional species (see Factsheet No. 4 titled *Selecting Plants for Agricultural Riparian Plantings* for details) will be much easier to establish and will grow much better than later successional species (primarily conifers in B.C.).
- **Correct spacing** - Each tree and shrub must be given the amount of space required to grow to maturity (see the species list for characteristics of each species). A dense planting (1 m or less) of pioneering species such as willows, cottonwood and alder can provide an effective cover in a short time, but may need to be thinned as they mature. If trees and shrubs are crowded together over the long term they will compete, become stunted and fail to achieve the function they were planted for.
- **Design to reduce maintenance** – planting designs should be developed to minimize the need for maintenance. Establishment of a dense cover (1 m spacing) of pioneering species that are adapted to your local area will minimize invasion by weedy species and will reduce maintenance needs.

- **Design for change** - Riparian plantings are usually established with relatively small plant material (shrubs and trees) selected for their ability to provide a function *while they develop*. As these trees and shrubs grow over decades they will occupy larger and larger areas above- and below-ground resulting in changes in the competition for light, water and nutrients. This change must be planned for and managed. Typically this will result in the death of those plants that are less competitive (e.g. As the amount of shade from trees and shrubs increases, shade tolerant species will increase and shade intolerant species will decrease). Native species adapted to these conditions will naturally establish in the riparian area once conditions are suitable.
- **Design to shade stream water** – Use of fast growing pioneering species such as willows and cottonwood will provide shade for the stream in the summer when high temperatures can cause problems with aquatic organisms. Be sure to plant these quick growing species on the south and southwest sides of the stream as they will provide shade to the stream in these positions. The use of tall living stakes of willow and cottonwood that are established along the edge of the water with the butt ends well into the wet soil will provide a



good shady cover during the first summer following planting. A soil bioengineering technique called live shade (see drawing) can be a very effective way of providing shade on small streams and ditches. This technique uses living cuttings of willow and

cottonwood to create a tripod over the stream. As the cuttings sprout and grow, the leafy canopy shades the stream. Shade density can be adjusted by placing the tripods closer together or further apart depending on the conditions of the stream.

4. *Selecting the Right Plants*

Riparian areas in B.C. should be planted with native B.C. species only (see box below). Although some non-native species can grow well in the B.C. climate, they pose the risk of becoming invasive. For example, salt cedar, a non-native species that has been used for

riparian restoration in the Southwest USA is becoming a serious problem, replacing native species and destroying riparian habitat for many native birds and animals. Russian olive, another non-native species is becoming a problem in some of the drier areas of the Interior.

‘Locally’ Native Plants – a major issue with the use of native plants is - where is it native? For the purposes of this factsheet a “native plant” is defined as one that is an original inhabitant of the immediate geographic area. Native plant selections or plants originating from other areas of BC are not considered as native to the local area being managed.

Using native pioneering species such as willows, alder and cottonwood as the foundation for riparian planting projects will ensure that the vegetation that is established is appropriate for the site being treated.

5. *Planning for Maintenance*

- **PROBLEM: Small and medium-sized mammals** - Voles and other rodents can damage or eliminate new riparian plantings in a very short period of time. Unlike mice (seed eaters) voles and some other rodents will feed on above- and below-ground structures of trees and shrubs. Techniques to reduce the damage are available but must be integrated during the planning stages.
 1. Heavy weed and grass growth is the primary reason for high levels of vole damage. To reduce or prevent vole damage, control weed growth until trees and shrubs are of a size to escape predation.
 2. For medium-sized mammals such as beaver, mountain beaver, porcupine and hares, tree protectors are an effective means of reducing damage.
 3. Beaver are a significant problem in some areas. If beaver are active in the area contact the local BC Ministry of Environment office for assistance.
 4. Raptor roosts may encourage avian predators, increasing the diversity of the riparian area. Although their ability to control rodent populations is limited they may reduce some damage.
- **PROBLEM: Large mammals** - Deer, elk, moose, cattle and related animals can cause significant browsing damage to shrubs and trees in riparian plantings. This is a problem that should be detected while monitoring the planting. If a problem is detected, fencing, tree protectors or

repellents should be considered. Sometimes a dense planting of tall willow or cottonwood cuttings can be used to establish a riparian cover that is out of reach of large mammals

- **PROBLEM: Weeds** - Weed control is critical if the new riparian planting is to grow and produce the desired function. A detailed weed control plan should be developed for the first 3 years after planting. This plan must be modified based on the results of monitoring.
 5. Dense plantings of trees and shrubs will occupy the space that might be invaded by weeds.
 6. Shade from planted shrubs and trees may reduce or eliminate shade intolerant aquatic and terrestrial vegetation. Trees and shrubs will only produce shade if they are provided with good growing conditions. Some plants like Reed Canary Grass are very difficult to shade out once established due to root competition.

For more information about weeds in riparian areas see Factsheet No.7 *Riparian Weed Management*.

- **PROBLEM: moisture** - New plantings in upland zones of all riparian areas may suffer from drought during the summer. Depending on species chosen, irrigation may be necessary for planting survival. In addition, drought stressed plants are more susceptible to damage from insects and diseases. If shrubs and trees grow well for 2 or 3 years irrigation should be reduced or eliminated.

Factors to Consider in the Selection of Planting Material

- **Insects and diseases**

- Plant material should be selected that has few disease and insect problems. This is of particular importance in the case of trees and shrubs that are susceptible to diseases which could kill them. For example White Pine Blister Rust can kill Western White Pine at 4 years of age.
- Plant material chosen should also not act as host to insects or diseases that could be transferred to commercial crops. Plants that could be hosts of problem insects and diseases are identified in the factsheet *Selecting Plants for Riparian Plantings*, (Factsheet No. 4).

- **Invasive plants**

- Non-native alien invasive plants that could become a problem in the watercourse or in agricultural fields should not be planted in agricultural riparian areas. Plants of significant concern have not been included in the factsheet **Selecting Plants for Riparian Plantings, Factsheet #4**. Please note that some native plants are also invasive.

- **Shading of stream water**

- Select trees and shrubs that either lean over the water or are tall enough to produce a long enough shadow to reach the stream. Use of soil bioengineering treatments such as live shade described above can provide an effective solution to stream shading.

- **Diversity of plant species in riparian areas**

- Selection of pioneering species as the main species to plant will encourage establishment of other species as the stand matures. By re-establishing the natural successional trajectory for the area, the long-term vegetation cover will be assured.
- In contrast to many agricultural production systems, fully functioning riparian plantings should contain a mix of several different plant species. In most cases, these will naturally establish if the appropriate pioneering species have been planted initially.
- A range of plant species is planted in riparian areas in order to achieve the differing functions desired. Some plants have stronger roots; some have roots that grow deeper; some have fine fibrous roots; some grow faster; some are taller; some take up more nutrients than others. Specific problems can be corrected more effectively by selecting certain plants or groups of plants than others.
- A planting with a well thought out diversity of plant species produces a more stable planting than one with only one or two species. Stable plantings are those that are capable of dealing with change (floods or drought) and resisting problems (invasive weeds).

- **Small organic debris (falling into the water)**
 - Plant selection for riparian plantings should include species that drop leaves, fruit and insects into the water. Fish feed on terrestrial insects that fall into the stream. Aquatic insects feed on the leaves and fruit and in turn become fish food.
- **Streambank erosion**
 - **Root type:** the best protection of stream banks against the erosive power of stream water is a mix of plants with differing types of root systems. For example, one of the strongest mixtures is a combination of sedge and willow. The willow provides deep roots for anchorage and the sedge provides very strong fibrous roots near the surface. The combination provides a strong root matrix with both shallow and deep roots.
 - **Green-up:** After major work in and around streams there is often a large amount of bare soil. It is very important to seed these bare areas with a seed mix that will germinate and grow quickly providing 'Green-up' protection of the soil from heavy rains and floods. Care must be taken, however to avoid establishing a dense cover that will compete with the planted woody species. Use of native sedges (transplanted from adjacent areas) can be an effective means of controlling erosion along the edge of slower moving streams.
- **Trespass**
 - People sometimes use riparian vegetation as cover in order to trespass onto farm and ranch land. Fencing is one solution. Another solution is to use thorny riparian species to make a 'living fence'. The most commonly used species for this purpose in BC is Black Hawthorn (*Crataegus douglassii*). See the factsheet **Selecting Plants for Riparian Plantings** (Factsheet No.4) for other suitable species.
- **Broad Leaved vs Conifers:**
 - Broadleaves and conifers have different characteristics which make them suitable for differing functions. Broad-leaved trees usually grow faster than conifers and provide more shade during the critical summer months. Broadleaves also provide more small organic debris and they tend to be shorter-lived than conifers.
 - Conifers keep their leaves through the winter providing winter wind and snow drift protection. Planting conifers under a canopy of deciduous species can be an effective means of ensuring the long term stability of the riparian ecosystem.
 - Conifers are the preferred species for production of large woody debris in the long term if one of the objectives is to grow wood to enhance stream habitat in future years
- **Wildlife value**
 - Plants can be chosen for riparian plantings to encourage or discourage wildlife. Shrubs and trees that produce berries will encourage birds. However, farms that are already having problems with bird predation on crops should avoid these plants.
- **Nutrient interception**
 - One of the functions of riparian plantings is the interception of nutrients from the farm. Some species are able to take up many times the amount of nutrients that the average riparian plants are capable of. One of the best performers in this function is cottonwood. Other selections worth considering for this function are the willow, red-osier dogwood and aspen.
- **Moisture requirement**
 - Plants that are adapted to the dry areas of the province should be used in these areas. Similarly, if summer irrigation is not available selection of plants that are adapted to dry conditions is crucial.
- **Width of the riparian planting**
 - The goal should be to establish plantings that achieve a specific function(s), regardless of width. Well designed narrow riparian plantings perform many functions as well or better than very wide riparian plantings that were poorly designed.
 - The width of the riparian planting should be directly related to:
 - a. **the function the planting is to perform**
 - b. **the site – topography**
 - c. **the plant materials used**

- Functions such as filtering large amounts of sediment or nutrients from surface or subsurface water must not be stand-alone riparian functions. Rather than establishing very wide riparian plantings the **Best Management Practice** may be a

Nutrient Management Plan or a filter strip of grasses and legumes planted on the field side of the riparian area in combination with a riparian planting of woody species.



FOR FURTHER INFORMATION CONTACT

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