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Fascines for Riparian Erosion Control

The following factsheet describes how fascines can be used to reduce erosion in riparian areas.

Background

Erosion along the banks of streams, rivers, lakes, and other water bodies can weaken or damage surrounding infrastructure and reduce water quality. Bank erosion can be caused by natural factors such as channel migration, or human activities such as shoreline development, recreation, or livestock use. Numerous methods may be used to reduce and prevent erosion. Heavy engineering and machinery (i.e. rip rap, gabion baskets) is one option, but is costly and reduces the habitat quality and aesthetics of the surrounding environment.

Bioengineering is another option that involves using natural materials to reduce and prevent bank erosion, enhancing both water quality and wildlife habitat. "Fascines" are a commonly used natural material for bioengineering projects (Figure 1). Fascines are bundles of live woody stems that, when planted in trenches, grow into clumps of erosion-fighting vegetation.

Figure 1. A fascine consisting of live willow (*Salix spp.*) stem cuttings. Photo by Salixrw.com.

The following fact sheet outlines some of the benefits of fascines and provides guidelines for planting them.

Uses of Fascines

Fascines can be planted along banks to reduce erosion caused by wave action or surface run-off. If planted appropriately, they can offer immediate structural bank protection by reducing surface water velocity. This makes them highly useful for slopes experiencing light to moderate erosion, where individual cuttings, seedlings, or seeds would quickly wash away.

It should be noted that fascines can also be washed away at sites experiencing heavy erosion, or on steep slopes (greater than 1:1 vertical to horizontal). However, if they are able to last for a couple of months after planting, roots will begin to form and grow around and under them. These roots will stabilize the soil in the long-term, and also remove excess soil moisture through evapotranspiration.

Site Suitability and Preparation

Prior to planting, it is important to determine the severity and cause of erosion, and the feasibility of planting. This involves assessing the conditions of the planned site, including its topography (i.e. slope of the bank), the shape and hydrology of the adjacent water body, and soil characteristics.

Common characteristics of erosion-prone sites include (Figure 2):

- Steep slopes
- Exposed soil
- Frequent flooding cycles
- Subject to high water velocities and discharges
- Sandy soils
- Soils with low organic matter

Figure 2. Planting fascines would benefit this erosion prone site in central Alberta. Photo by AWES.

Make note of whether the site is actively experiencing high levels of erosion. Significant erosion of the "toe zone" (i.e. the portion of the bank that is nearest to the water and frequently flooded) will undercut the bank and destabilize any planted fascines. Repair work and mechanical stabilization (e.g. rip rap) may be necessary before fascines can be planted.

Also note that work around shorelines and/or streambanks may require approval from local conservation authorities, or county, provincial or federal agencies such as Fisheries and Oceans. Before beginning any work, ensure that the proper permits have been acquired by contacting Alberta Environment and Parks, http://aep.alberta.ca/.

Materials and Assembly

The materials required to build fascines include stem cuttings (i.e. long woody branches) of an appropriate species, twine to tie the cuttings into bundles, and large stakes to secure the bundles in the ground. Each of these is discussed in greater detail below.

Figure 3. Cuttings from species such as red osier dogwood (*Cornus sericea*) can be harvested using loppers. Photo by AWES.

a. Stem Cuttings

The most commonly used species for stem cuttings are willows (*Salix spp.*), red osier dogwood (*Cornus senicea*), balsam poplar (*Populus balsamifera*), and plains cottonwood (*Populus deltoides*). Willow and dogwood cuttings are most effective as they tend to root easily.

Stem cuttings should be harvested during the dormant season (November to March) (Figure 3). Cuttings can vary in length from 1-2.5 m and should be as straight as possible with few side branches. Once the cuttings are harvested, they can be stored for up to six months between -5 and 4°C (colder temperatures allow for longer storage), and then completely soaked for 2-6 days prior to planting.

b. Twine

Biodegradable untreated twine should be used to tie fascines together.

c. Stakes

Wooden stakes can be purchased from hardware stores or made by cutting pieces of 2x4" board diagonally lengthwise (ensure a minimum length of 75 cm). Live stakes can also be made using larger branches. Live branches used for stakes need to be sufficiently large and strong, so they can withstand being hammered into the soil. The optimum diameter for live stakes is 1-5 cm.

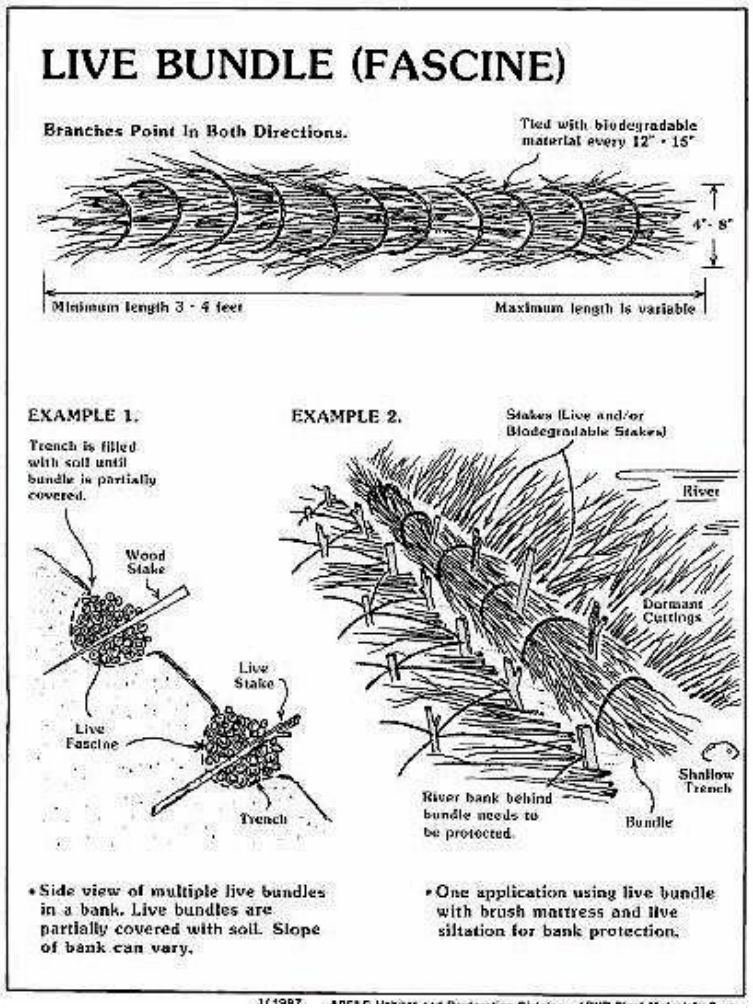

Figure 4. Examples of fascine bioengineering applications. Graphic by Alaska Department of Fish and Game.

Construction

Fascines can be easily bundled by placing cuttings on a saw horse. Live ends should be pointed in the same direction, with cut ends staggered throughout the bundle. Each bundle should be roughly 15-20 cm in diameter and 1.5-3 m in length, which works out to about five cuttings per bundle (Figure 4). Using the twine, the cuttings can then be tied together every 30-40 cm.

Installation

The fascines can be installed in rows along the bank in the dormant season or beginning of the growing season. The distance between each row varies from 0.9-2.5 m, with more erosion prone sites requiring more closely spaced rows (see above for some common characteristics of erosion prone sites).

Installation begins by digging trenches running parallel to the edge of the water body (Figure 5). Trenches are generally 25 cm wide and deep (i.e. slightly larger than the size of the bundles). Fascines can then be inserted into the trenches, leaving 20% of the fascine above ground. Additional topsoil can then be added to fill in the spaces between the cuttings, and the stakes hammered into the bundles to hold the fascines in place.

Figure 5. Digging a trench for fascine installation. Photo by AWES.

Maintenance

If planted properly, fascines require little ongoing maintenance. However, it is important to monitor fascine health and stability, particularly during droughts, or after flooding events. Ensure that fascines receive adequate moisture and are well-protected from livestock or wildlife (e.g. beaver, deer), especially in the first couple of years following planting. Periodic pruning of the willow or dogwood as it matures helps maintain its vigor.

Figure 6. A fully grown fascine of sandbar willow (*Salix exigua*). Photo by AWES.

For more information on fascines, please contact us at:

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This fact sheet was completed using information from the following references:

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