SOIL AND WATER BIOENGINEERING

LIVE FASCINES

SWB16

NATURE-DEMO

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ADDRESSED HAZARDS

PROTECTED CRITICAL INFRASTRUCTURE

Primary functions and key services

- **Bank stabilisation**
- **Surface protection and bank erosion control**
- **Flood protection**
- **Habitat creation**

What is it?

Live fascines are an effective SWB technique for bank erosion and surface protection, riparian buffer restoration or slope drainage. Fascines are bundles of live willow branches, used as single linear elements or arranged vertically (fascine wall) or up-slope on top of each other (fascine row) as a surface protection. Slight coverage with sediments is needed for shoot growth.
(Schiechtl, 1996; Zeh, 2007; Holm et al., 2002).

Site suitability, scale and coverage

Fascine rows are used as a bank protection technique, typically to prevent rain-splash and mean-water level erosion, and therefore is suitable for most streambanks. Its spatial application is in the mid-bank, for a resistive, continuous, and outer or inner bend hydro-geomorphic setting. Where it best applies is for immediate erosion protection in a setting with sufficient flow at low-water level to keep the base of the bundle wet during most of the growing season, but under the flood tolerance limits of the fascine (Sotir & Fischenich, 2001).

Vertical application of fascine walls is restricted up to the mid-bank (max. heights of 1 m) due to self-shading. It is effective in narrow, channelled stream settings (Florineth, 2012).

Live fascine row under construction, Veitschbach, Styria (A);
Image Credit: [Rosemarie Stangl], [2023], Used with permission.

Challenges this NbS addresses

(Schiechtl, 1980; Sorolla et al., 2020; Sorolla et al., 2021)

- **Flooding,** helping to protect neighborhoods with **housing** and other **building services** exposed to flooding, **local transport connections** or **bridges**.
- **Embankment cutting prevention and recovery,** which reduces sediment mobilisation and bank failure.
- **Riparian forest recovery,** helping to alleviate heat stresses and supporting the outdoor energy balance of nearby **housing** states.

Trees growing from a fascine wall 20 years after installation, Liesingbach (A);
Image Credit: [Rosemarie Stangl], [2016]. Used with permission;

Cost-benefit profile

Following are year 2000 cost ranges for live fascines projects based on Sotir & Fischenich (2001), which include profit margins and contingency factors on contractor bid projects:

- Live fascines costs ranged from $10 to $30 per feet for 6- to 8-inch bundles, including labor rates.

The price included securing devices for installation, twine (for fabrication), harvesting, transportation, handling, fabrication, and storage of live-cut branch materials, excavation, backfill, and compaction. Costs, however, vary with conceptual design, accessibility constraints, specific period of the year for its implementation, and overall labor rates. Bundle fabrication is relatively simple and is performed prior to installation (Sotir & Fischenich, 2001).

Ecosystem services

- **Riparian forest restoration**
- **Habitat creation**
- **Biodiversity enhancement**
- **Carbon sequestration**
- **Water filtration**
- **Soil fertility enhancement**
- **Floodwater absorption**
- **Pollination**

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Main components

Compact bundle of tied willow branches:
Fascines are buried partially into the soil, basal ends of the bundles are inserted in the bank body to improve rooting. Fascines need slight coverage with earth for triggering budding without suppressing shoot growth.

Live stakes can be used for fascine fixation, if "planted" in dormant state.

Live fascines can be implemented for varying purposes: fascine rows or vertical walls, submerged fascines for bank toe protection, slope fascines for drainage purposes, or in combination with other SWB construction designs (eg. river bank crib walls). (Schiechtl, 1996; Zeh, 2007; Holm et al., 2002).

Environmental impacts (EU taxonomy)

- ☑ **Climate change mitigation**
- ☑ **Climate change adaptation**
- ☑ **Sustainable use and protection of water and marine resources**
- ☐ **Transition to a circular economy**
- ☑ **Pollution prevention and control**
- ☑ **Protection and restoration of biodiversity and ecosystems.**

Example of installation

- **Fascines as shoreline stabilisation in Templin, Germany**
- **Implemented by:** Government, local authorities, NGOs and organisations in Templin, Germany.
- **Description and results:** Living fascines used for the stabilisation of the riverbanks in Templin (Germany) consisting of bundles of living wood that with time developed above ground vegetative growth and below ground root systems. The live fascines system contributed to additional soil protection. The implementation of living fascines has substituted a conventional engineering practice while creating new habitats. In fact, this measure also demonstrated to bring a better structural connectivity of natural habitats, thereby supporting biodiversity.

Live fascines at riverbank in Templin, Germany - implementation process, earth substrate to be incorporated on top for triggering budding without suppressing shoot growth
Image Credit: [Sebastian Wallroth], [2006], Public domain.

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