

Summary of Methods Used in Stream Restoration

Tools for stream restoration require expertise in a variety of disciplines: fish biology, hydrology, engineering, and water resource management. Large-scale in-stream habitat projects require agency permits and tend to be quite complex in nature. For this reason, this appendix focuses on “on-the-ground” riparian restoration techniques that Tree Farmers can use to improve streamside habitat. However, the methods discussed are not appropriate for every stream. Careful review and consultation with local experts is essential in selecting appropriate methods for your stream.

This manual offers basic information on a few simple techniques, the problems that they can help address, basic guidance on where they may be appropriate, and an overview of advantages and disadvantages of each technique. Practical considerations (such as costs, manpower requirements, and material and equipment needs) are also noted.

Trout stream rehabilitation is difficult work, and technical assistance from professional biologists is essential in designing projects using these techniques. You can also consult the bibliography at the end of this guide for more detailed information.

Common Methods for Habitat Restoration Projects

PLANTING STREAMSIDE VEGETATION

What: Planting vegetation (such as grasses, legumes, willows, bushes, trees) along a stream channel to stabilize banks, provide cover and shade, regulate stream flows, attract wildlife and insects, and improve aesthetics of the stream

Stream problems: Lack of riparian vegetation; unstable stream banks leading to erosion; excessive sediment inputs from runoff and/or eroding banks; inadequate streamside cover; high stream temperatures due to lack of shade

Where: Along unstable stream banks where vegetation has been removed (for example by grazing); often done in connection with other habitat enhancement projects, for stabilization and to restore natural appearance

Advantages:

- stabilizes banks and reduces erosion
- shade from streamside plants can help keep stream temperatures down
- vegetated strip along stream banks reduces the sediment and pollutants reaching the stream in runoff
- provides cover for trout
- can result in steadier flows by moderating release of water into stream
- attracts wildlife and trout food species
- nonstructural method allows stream to find its own equilibrium
- may reduce flooding
- relatively inexpensive
- improves appearance of stream

Disadvantages:

- may attract unwanted weed species
- can only be conducted seasonally; summer and late fall germination may be difficult

Other considerations: Whenever possible, use native plant species for vegetation projects (consult state biologists or botanists to find what plants can best fill your needs). In areas where cover is desired, consider grasses and legumes near the stream. Where shade is needed, plant streamside shrubs and trees slightly back from the stream. Biodegradable matting can be used to hold soil in place until plant roots mature.

Dense vegetation is not always desirable. It can limit aquatic plant growth (reducing stream productivity) and make a stream less accessible to anglers. To increase macroinvertebrate production, you may want to leave some open areas along riffles (where these trout food organisms are most abundant).

Any project that involves entering the streambed requires an agency permit and is subject to government review and approval before work can begin.

STREAMSIDE FENCING

What: Fencing placed along the stream corridor or riparian zone to protect streamside vegetation, banks, and the integrity of the aquatic ecosystem

Stream problems: Excessive erosion due to livestock trampling on unstable banks; sediment and pollution from runoff flowing over grazed-down riparian areas and into stream; water quality impairment from animal wastes; damaged instream habitat from livestock entering the stream; reduced infiltration into groundwater due to soils compacted by livestock trampling

Where: Lands where agricultural and livestock use is degrading stream habitats; streams with trampled banks and overgrazed riparian zones

Advantages:

- allows riparian vegetation to return, providing terrestrial insects, cover and shade to stream
- establishing buffer strip along stream banks reduces the sediment and pollutants reaching the stream in runoff
- encourages more confined stream flow in a narrower, deeper channel
- protects and stabilizes banks, reducing erosion and sedimentation
- keeps livestock out of stream, avoiding habitat destruction and water quality impairment from nutrients in livestock wastes
- allows stream to heal itself, using natural processes
- allows natural appearance to be restored along stream

Disadvantages:

- fence building can be costly (especially along highly meandering streams)
- landowner resistance to removing ground from agricultural use
- alternative watering source may have to be developed for livestock (e.g., watering points in the stream, hydraulic/electric pumps)
- crossing sites for livestock and equipment may be expensive to build, depending on width, excavation, and protection work required
- regular inspection and maintenance will be needed

ROOTWADS & WOODY BANK MATERIAL

What: Cover logs, rootwads, trees, or brush secured along stream banks to protect bank and provide cover

Stream problems: Excessive erosion from unstable banks; inadequate cover and rearing habitat for trout

Where: Along banks of moderate and low gradient streams. Often placed along outside of meanders. Best used in areas where stream has sufficient depth for the material to provide usable cover for juvenile fish. Consult local experts to determine whether debris in your stream would be beneficial or could actually damage habitat.

Advantages:

- simple and inexpensive construction
- natural appearance
- provides good cover for juvenile trout
- source of organic material in stream
- offers some bank protection
- has little impact on natural stream flow compared to other structures
- little maintenance is necessary
- effective on a wide variety of stream types

Disadvantages:

- may catch debris or sediment altering flow or partially damming the stream

Other considerations: Stream bank stabilization projects usually require agency permits before work can begin. Be sure materials are well-secured, or they can be easily washed away in flood flows. For durability, wood should be submerged to reduce rotting.

INSTREAM DEBRIS REMOVAL

What: Removal of rocks, trash, or woody debris that may be damming the stream channel or diverting and slowing natural stream currents

Stream problems: Excessive siltation caused by debris that is slowing stream flow; high stream temperatures due to impoundment of water by debris; streambank erosion due to debris redirecting currents at unstable banks

Where: Streams where excessive debris clogs the channel, diverting and slowing the natural currents and/or damming the channel, allowing silts to settle on the substrate. Be cautious in choosing where to use this method; debris provides cover and can encourage natural scouring to create pools that trout can use. Consult local experts to determine whether debris in your stream is beneficial or is actually damaging habitat.

Advantages:

- natural current is quickened, scouring the accumulated silt and debris deposits
- exposure of gravel substrate encourages aquatic insect growth and can improve spawning habitat
- stream temperature may be reduced (by eliminating damming)

- channel width may be reduced
- can reduce bank erosion where debris directs current at unstable banks

Disadvantages:

- release of silts could damage downstream habitats
- continuing maintenance may be needed if the source of debris remains
- some cover, habitat complexity may be lost

Other considerations: Any project that involves entering the streambed requires an agency permit and is subject to government review and approval before work can begin. Look at the big picture; removing debris may have unintended effects downstream. You may want to leave debris, or time its removal carefully, if the silt that is released will flow into important habitat downstream (such as spawning grounds!) Work with a biologist to decide how much debris should be removed and what should remain to provide habitat diversity. Because the stream channel and flow patterns may change when excess debris is removed, you should not do stabilization work immediately. Allow the stream to return to its natural state — give it time to stabilize and revegetate before you jump into additional projects.

FISH PASSAGE

What: Modifying or removing culverts or other fish barriers so as to permit movement of fish through or around them, connecting habitat above and below the barrier. May be a possible project.

Stream problems: Available habitat not accessible to resident or anadromous fish because of barrier; fish migration to spawning habitat prevented

Where: Dams, stream segments blocked off with excess debris, improperly-placed culverts, or other artificial barriers to fish movement. Should generally not be used to open fish passage around natural barriers and access habitats that have not previously been used, because of potential impacts on native aquatic species upstream.

Advantages:

- allows fish access to additional habitat
- allows free movement of anadromous or other migratory fish
- reduces sediment load from improper functioning and placement of culverts

Disadvantages:

- larger projects may be expensive if funding not secured from developers responsible for the barrier
- possible negative impacts on species or stocks in the newly accessed habitat

Other considerations: Get design assistance from experts! Fish passage work involves the stream bed and thus requires a permit. You will need to be sure that water depth is sufficient for fish to pass freely (e.g., through a culvert); that water velocities are low enough to allow fish to swim upstream; that pool depth below any points where fish must jump will be sufficient to enable them to make the leap; and that culvert lengths and gradient are not prohibitive for fish movement. There are many opportunities to work on fish passage projects with your state and federal agencies.