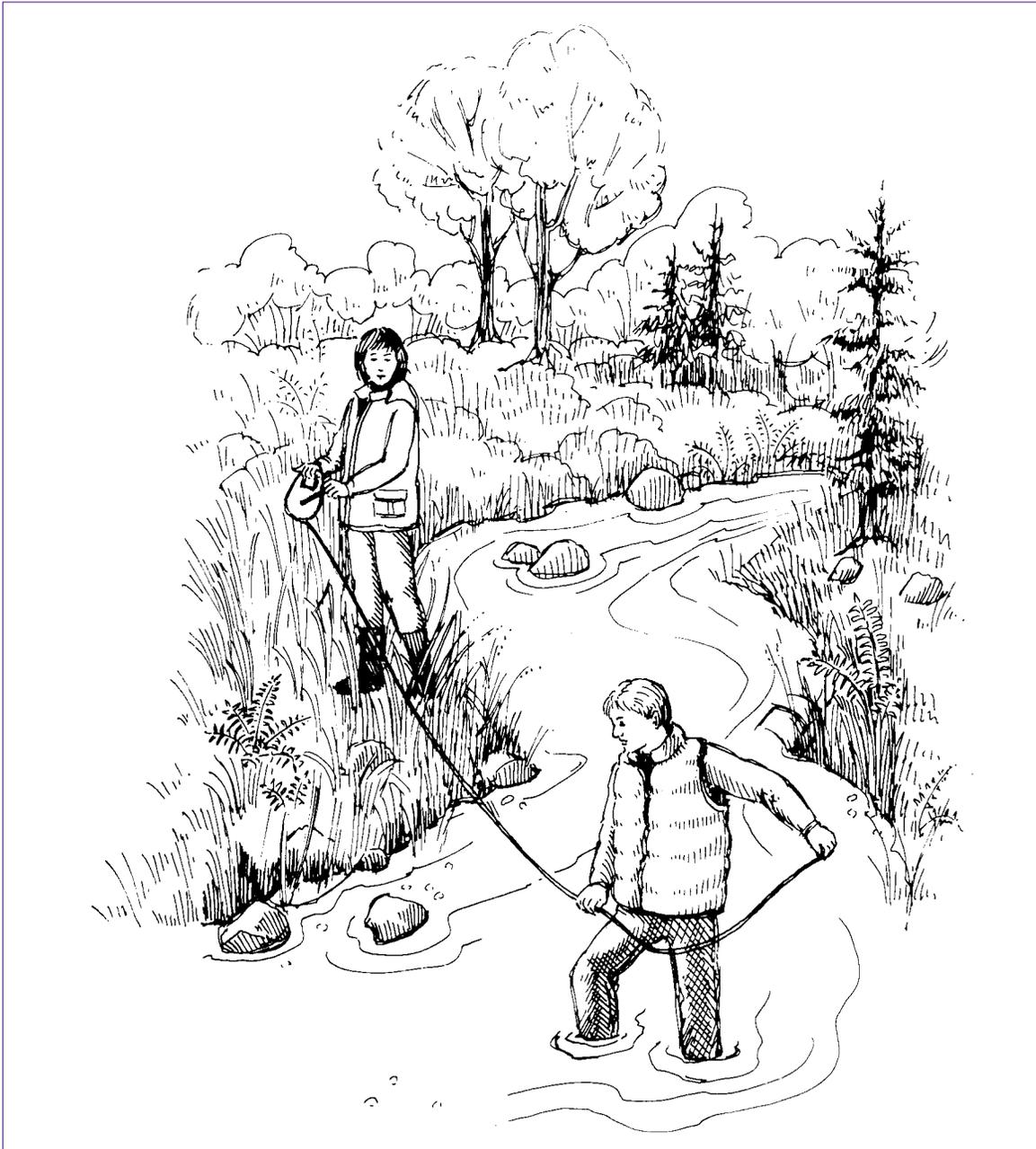


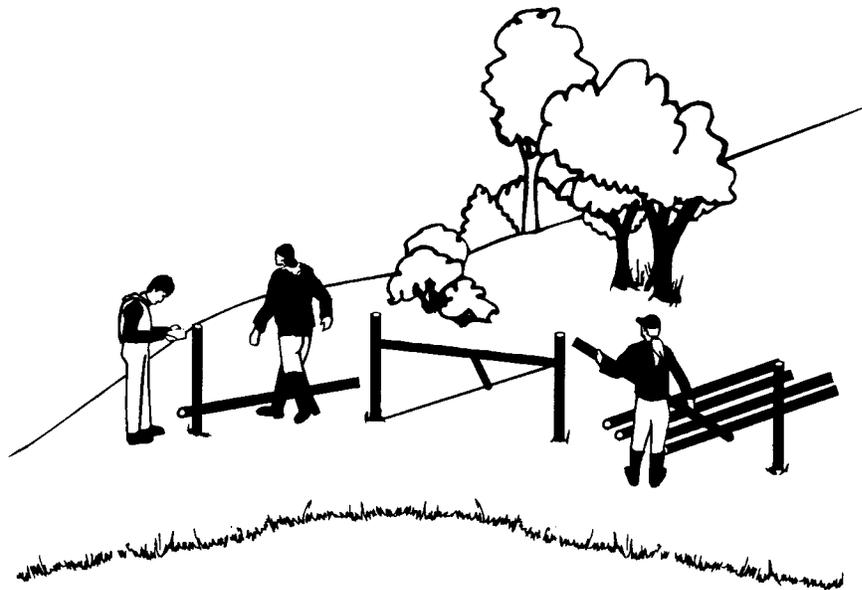
The Streamkeepers Handbook

A Practical Guide To Stream And Wetland Care



STREAMKEEPERS

***Module 8
Streamside
Fencing***



Project Approval Required	Training	Time Commitment (per year)	Number of People	Time of Year
no	Not necessary	several days	2 or more	spring through fall

The **Stewardship** Series

MODULE 8

Streamside Fencing

Welcome to the Streamkeepers Program! The Department of Fisheries and Oceans Community Involvement Program provides these Streamkeepers training modules. These modules encourage “hands on” environmental activities in watersheds in British Columbia. Volunteer groups, schools, and individuals are using this material to monitor and restore local waterways. Your local Fisheries and Oceans Community Advisor can provide more information.

Acknowledgments

Bryan Allen, Community Advisor with the Department of Fisheries and Oceans, and Karen Munro organized the material for this module. Lance Brown of the Ministry of Agriculture, Fisheries and Food, in Kamloops, provided advice on current fencing practices. Dr. D.A. Quinton, Agricultural Research Station, Kamloops, gave permission to use information from his Agriculture Canada publication *Wire Fences for Livestock Management*.

Project Activity and Purpose

This module provides guidance for constructing wire fences to control livestock access to riparian areas along streams, ponds and wetlands. Instructions for building both barbed wire and smooth wire fences are provided. Woven wire and electrical fences are described, but only briefly. Streamside fencing protects existing riparian vegetation, and allows regeneration of heavily grazed areas.

Introduction

Streamside or riparian areas are important parts of a stream ecosystem. The root systems of plants stabilize banks, help control erosion, and absorb contaminants that otherwise would enter the stream. Trees and shrubs provide shade, cover and food for many land and water-dwelling organisms. This vegetation and water are very attractive to livestock as well as wildlife. Protecting the aquatic and bank areas is essential to maintaining a healthy stream ecosystem.

Livestock can damage the riparian zone and stream quality when they have uncontrolled access to the stream. Livestock reduce or eliminate stream bank vegetation by grazing and trampling it. They

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damage streambeds and banks when they walk into streams to drink. Over time, this causes streams to change shape: bottoms become muddier, channels widen, and pools fill in. Erosion and lack of shade cause increased turbidity, increased water temperatures, and decreased dissolved oxygen levels. Nutrient concentrations increase due to the addition of animal wastes and these nutrient loads lead to algal and bacterial blooms. When blooms decompose, this increases the biological oxygen demand. Water contaminated by manure also contains disease-causing organisms.

Restricting livestock access to streams provides benefits to landowners as well. Soil erosion is reduced greatly. Animals provided with clean water are healthier and gain weight more quickly than those provided with unpalatable waste-contaminated water. Animals also pass on bacteria and viruses in waste-contaminated water. Mastitis, a disease likely to infect dairy cows living in wet, muddy environments, is one example. Fencing also helps prevent accident. Many farm animals are injured or killed very year when stream banks collapse under them or they slip on slippery stream banks.

Most opportunities for fencing occur on privately owned land, where you must have the approval and cooperation of the landowner. You may find it helpful to have someone who knows the owner, such as a local Provincial District Agriculturist, introduce you group and explain the benefits of a fencing project. You will find property owners more cooperative if you can provide details of costs and financial arrangements ahead of time. Before starting the work, you and the landowner should agree on ownership of the fence and routine maintenance. You may decide to arrange a formal contractual agreement. Explain to the landowner the importance of not disturbing the fenced streamside vegetation. Ask the owner when and where to start the work. You may need to wait for mares to finish foaling, or animals to move to another pasture.

Landowners may have genuine concerns about the impact of fencing on their property. They may worry about the competence of the fence builders and, therefore, the quality of the finished fence. After all, their livestock are at risk from a poorly built fence. You may wish to let them supervise the work, or offer other assurances of fence quality. Your group may wish to arrange for liability insurance, to reduce landowner responsibility for volunteers working on their property. Landowners will want continued access to water for their livestock, so you can incorporate troughs of inset watering areas in the fence design. They may be concerned about growth of undesirable plants behind the fence. A volunteer group usually restores the stream banks by planting native species (Module 7) in association with the fencing project. Planting stream banks involves a commitment to weeding and maintaining the site, which inhibits growth of undesirable plants. It also provides an opportunity to discuss with the landowner the most

suitable species to plant. For example, cottonwood is commonly used for bank restoration. However, some farmers consider it a nuisance species, because seedlings sprout up everywhere.

Consider the type and size of livestock involved when you design the fence. There are several styles of wire fences, each suitable for particular animals. Smooth wire fences are used for many animals. Barbed wire fences are acceptable for thick skinned cattle. Wooden post-and-rail fences are used for horses on many properties. Woven or page wire fences will control smaller animals like foals, calves, and sheep. Electric fences require a power source and frequent maintenance, but are practical and inexpensive in many situations.

This module describes general recommendations for building fences on stream banks. D.A. Winton's publication, *Wire Fences for Livestock Management*, provides site-specific details, equipment lists, and techniques. This publication is available from Agriculture Canada offices. The provincial Ministry of Agriculture, Fisheries, and Food also has publications and fact sheets that describe fencing techniques and adaptations for streamside areas.

Project Guidance and Approval

If your project is on private land, discuss details of maintenance with the landowner, and agree on the responsible party. On Crown Land, you may need a letter of permission from a provincial agency such as the Ministry of Forests or the Ministry of Environment, Lands, and Parks (MOELP). Any instream work, such as building fences across streams or inset watering ramps, requires MOELP approval.

The fence you build should comply with acceptable agricultural designs. Fence designs are specific to the site, the type of animal, and local customs. Find someone in your community with fencing experience to advise you on details. You also may contact your local B.C. Ministry of Agriculture, Fisheries, and Food office for advice. Consult your telephone directory or call Enquiry B.C. (1-800-663-7867) for information about the nearest provincial agriculture office.

Level of Effort

Fencing is a very costly project for a volunteer group. Materials alone can cost \$1000 or more per kilometre. You may need to scale down your project and consider fencing only the areas with most sensitive stream habitat first. Check the Community Stewardship guide (Anon., 1995) or your DFO Community Advisor for funding suggestions. Fencing suppliers may give you a discount if you tell them materials are to be used for a public service project.

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Fencing requires significant physical effort. Although two experienced farm workers with the proper equipment can do the job, you probably will need four volunteers to do the same work.

Time of Year and Working Conditions

In many parts of the province, fences are built from spring through fall. Digging may be a problem when the ground is frozen or wet. Be very careful handling wire in very cold weather. Stream protection guidelines require that stream crossings and inset watering areas be built during the summer, when work is least likely to disturb salmonids.

Safety

PERSONAL SAFETY

Concern for personal safety is essential when working outdoors. Always tell someone where you are going and when you will return. Work in pairs, never alone. Carry emergency telephone numbers for police and ambulance.

Do not attempt to wade fast water or water deeper than your knees. Watch out for slippery stream beds, undercut banks, waterfalls, and fast flowing areas. Log jams can be unstable, so take care to walk around them.

Get permission to cross or use private property.

Beware of domestic animals and wildlife.

HEALTH

Do not drink stream water. Although it may look pristine, it can harbour bacteria or parasites that will make you sick. Do not expose cuts and wounds to stream water. Know the symptoms and treatment for hypothermia.

Types of Fences

High-tensile smooth wire fences use 12-1/2 gauge, Class 3 galvanized steel wire. Smooth wire has several advantages over barbed wire. It is less expensive, easier to string out and tighten, requires no pretensioning, and has greater tensile strength. Smooth wire fences are safer for livestock and wildlife because there are no barbs to damage their hides. These fences tolerate greater shock loads than barbed wire fences because the wire is not stapled tightly to the posts.

Barbed wire is made from two-stranded low-tensile wire, and the barbs are considered a deterrent to animals. Many landowners still prefer barbed wire, despite the advantages of smooth wire. Two-stranded barbed wire needs to be pretensioned before being tied off.

Woven wire or page wire is used to confine small animals like sheep, calves, and foals. It is expensive, so it is used sparingly. Also, animals can become tangled in the wire. Page wire comes in rolls of various length, height, and wire spacing.

Electric fences often are used when temporary fencing is required. They are easy to install and practical, but require a reliable power source. Electric fences also are used for permanent fencing, but they require frequent maintenance, and have a potential liability factor associated with their use.

Wooden post-and-rail fences are used on many properties to fence horses. These fences are two to three times more expensive to build than wire fences.

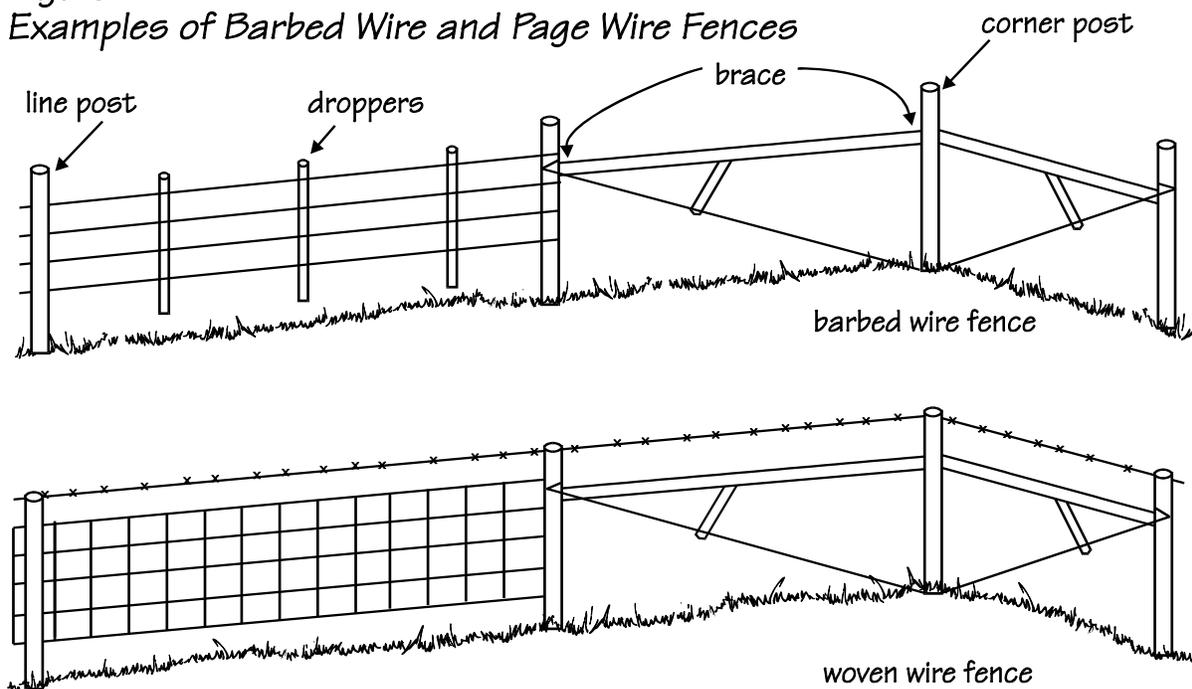
Procedure

Many details of your fencing project are best worked out according to the particular site chosen, so only federal guidelines are given here. Get advice from an experienced fence builder in your area and talk to staff at the local provincial or federal agriculture office. Quinton (1990) is a reference currently available for fence building instruction.

CHOOSE THE MOST EFFECTIVE FENCE TYPE AND PLAN THE FENCE

Build the fence to comply with acceptable agricultural designs and allow for crossing and watering points. Make your fence-line as straight and level as possible, to simplify construction and reduce your costs. Clear away as little vegetation as possible. You will need to accommodate dips and rises in the ground. Figure 1 shows examples of barbed wire and page wire fences.

Figure 1
Examples of Barbed Wire and Page Wire Fences



Set the fence back from the stream bank to allow free growth of streamside vegetation and some natural alteration of the channel. If the bank is actively sloughing, set the fence well back. Channel erosion may wash out your fence before the roots of new vegetation can become established enough to stabilize banks.

Barbed or smooth wire fences with four to six strands of wire are adequate to protect the riparian zone of most streams. The number of strands used depends on the expected livestock pressure on the fence. Livestock pressure refers to the chance of animals encountering and pushing on the fence. For instance, fenced range land is considered a low pressure situation, whereas a holding pen is a high pressure situation. Streamside fences on range land may be in a high pressure situation, because animals are attracted to stream areas, especially when the land has a low slope. An extra strand should be added in areas most likely to endure high livestock pressure. The additional cost of one extra wire strand is small. Sometimes, you may need a more specialized type of fence. For example, you may need woven wire or many strands of smooth wire to keep out sheep and young animals.

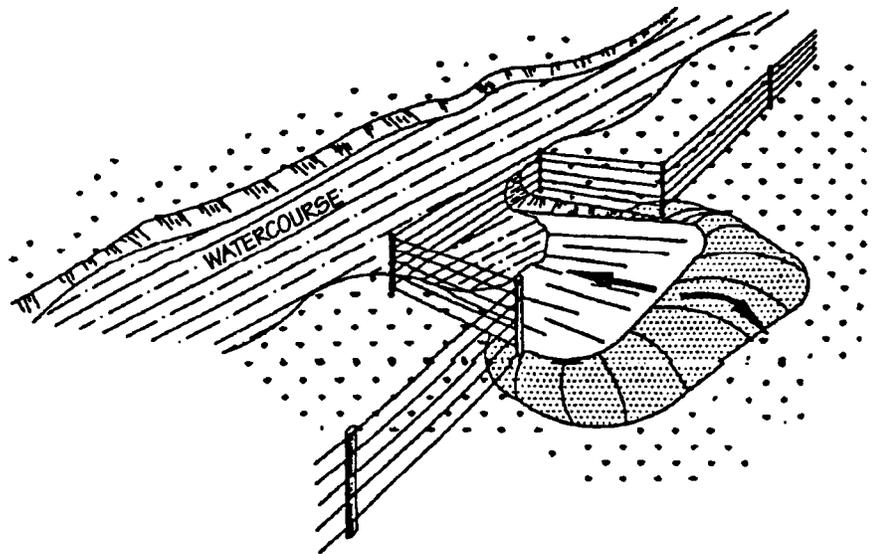
Measure the distance you plan to fence and make a sketch of the area. Work out the supplies needed and costs involved. Posts can be spaced every 5 to 12 m (5 to 13 yards), depending on the terrain.

DESIGN WATERING AND STREAM CROSSING POINTS

Assess the need for water access. You do not need to provide direct access when animals have other watering areas. You may wish to consider installing a pump and trough system as an alternative to providing access to the stream. Any instream watering points should keep livestock out of the fenced off areas to reduce sedimentation in the stream. Figure 2 is a design for a ramp inset watering area described by Brown (1994). The floor of the ramp should be constructed of clean material, such as poured slatted concrete, clean gravel over “GeoGrid” fabric, or precast concrete pads. Design the ramp with a gradient less than 10:1 to provide acceptable footing for livestock. Wherever possible, install the ramp in a straight, wide section of the stream where banks are stable and with a gentle slope.

Figure 2
A Ramp Inset Watering Area

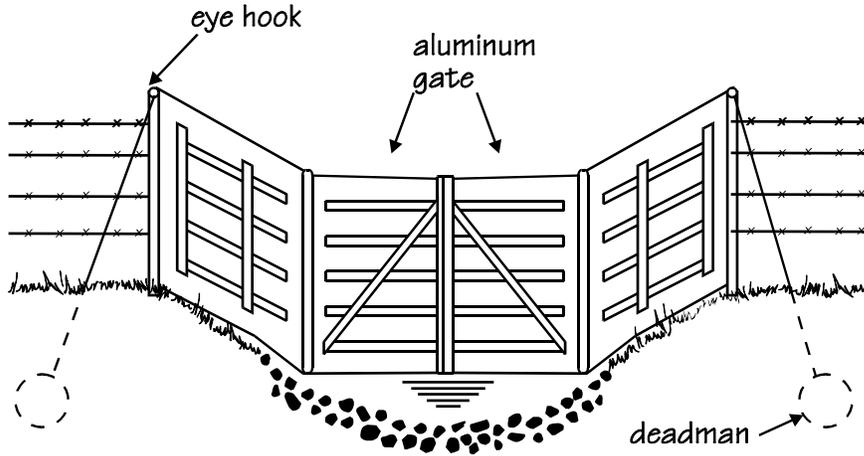
source: Brown, 1994



If you build a fence across the stream, make sure the lowest fence wire will be above the high water mark. You may wish to consider using an adjustable swing gate if the fence crosses a stream that has great fluctuations in water levels. This way, you can open the gate to let flood water and debris pass at high flows, but restrict livestock access to the stream at low flows. Figure 3 illustrates this type of gate at a livestock crossing, but a similar design is used on streams.

Figure 3
An Adjustable Swing Gate at a Livestock Crossing

source: Adams & Whyte, 1990



CONSTRUCT THE FENCE

Step 1. Prepare the fence line

Use survey stakes to mark the ends of the fence line. Push sighting poles into the ground just beyond the survey stakes.

You will use these sighting poles to make sure the fence line is straight. Level the ground along the fence line to remove high spots that could catch the bottom wire and low spots that could leave a large gap under the bottom wire.

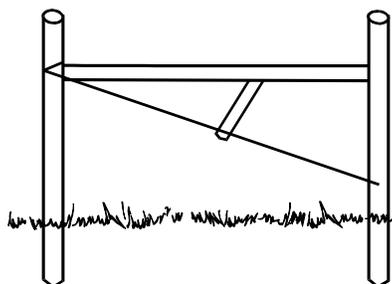
Step 2. Set end, corner, and gate posts

These posts usually are one size larger than posts used in the fence-line. Their location and placement are the most important factors in building a successful fence. These posts mark the beginning and end of each section of fence. Fence wire is attached and tightened at the posts. Auger pilot holes first, to help set the posts at the correct lean, then pound in the posts using a post pounder. Pound standard 244 cm (8 feet) posts 122 cm (4 feet) deep. If soil is loose or boggy, you will need to strengthen posts with deadman anchors. These prevent posts from twisting or pulling out. Typically, a deadman anchor consists of a large piece of wood buried in a trench near the post, and attached to it with cable or heavy wire. Sometimes deadman anchors are used instead of braces. Figure 1 shows the position of a deadman at a gate post.

Step 3. String guide wire

Guide wire is strung from one end post to the other, at the desired height of the bottom wire. When properly strung, the guide wire ensures a straight fence, with all wires parallel to the soil surface. Attach the guide wire to the first end post, then string it along the livestock side of the fence, not the stream side.

Figure 4
A Single Span
Horizontal
Brace Assembly



This way, pressure from livestock will push the wire against the posts, not away from them. The livestock side will receive the most pressure from animals. At the other end post, tighten the guide wire using wire pullers and temporarily attach it to the post, using a crimped sleeve or Wire vise.

Step 4. Construct brace assemblies

Brace assemblies are the anchors for the fence wire, so they must be as strong as possible. They are built at corners and ends of fences, at gates, and within the fence line whenever the slope changes significantly. Within the fence line, braces usually are spaced less than 400 metres (435 yards) apart.

Braces are built using 244 cm long (8 feet) fence posts that are one size bigger than line posts. The diagonal “twitch” wire is made with two complete wraps of smooth wire, to prevent brace failure. Figure 4 shows an example of a single span horizontal rail brace assembly. Other types, such as double braces, are used in fences exposed to great stress, using more than six wires, or built in loose or boggy soil.

Step 5. Set fence line posts

Line posts are regular fence posts set along the line of the fence, and are one size smaller than the bracing and end posts. Line posts maintain proper wire spacing, absorb some wire weight, prevent overturning, and add visibility to the fence. These posts can be set a maximum of 12 m (13 yards) apart. Pound in each post with the post pounder to a depth of at least 76 cm (2.5 feet). Make sure they are perpendicular to the fence wires and the ground.

Step 6. String line wire

Wire is supplied on a drum, so make a support for it that allows the wire to play out smoothly. Be careful when handling both barbed wire and high-tensile smooth wire. Wire, especially smooth wire, can recoil when cut. When you cut the wire, make sure the far end is attached to something and step on the wire near where you plan to cut it. Secure any cut ends or push them well into the soil.

You will need to string barbed wire one line at a time, to prevent tangling. Before it is stapled, barbed wire must be pretensioned to “set” the two strands and barbs. Smooth wire does not require pretensioning and all the wires can be strung at the same time. Always string the wire on the livestock side of the fence, except at the corners, where you should always put the wire on the outside of the turn. This makes a stronger fence, because the staples do not pull out when animals press against the fence. Attach the wires at the end posts, position them loosely on the line posts, and tension the wire.

Step 7. Staple wires in place and apply tension

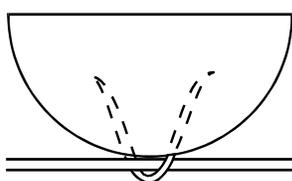
You can staple smooth wire to the line posts as you string it out. The staples should be loose enough to maintain even wire tension along the fence. This way, the wire can respond freely to pressure from animals leaning on the fence. You can apply tension to the wires after stapling, since smooth wire has no barbs and can move freely through the staples.

The staples must be inserted properly so they do not pull out (Figure 5). Staples are rotated away from the flat surface to increase resistance to being pulled out. Drive them in slightly off the vertical grain of the wood. If they are driven in vertically, the wood may split along the grain.

Barbed wire must be pretensioned to set the two strands and barbs. This involves applying 275 kg (600 lb) tension, then relaxing it to the 114 kg (250 lb) operating tension. Do this for each fence strand individually after it has been strung out and before it is stapled. Staple the wire using the same method as for smooth wire.

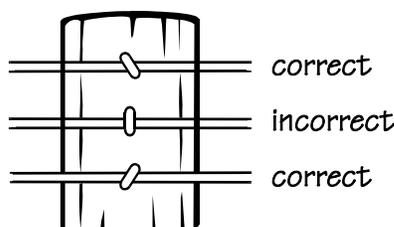
Figure 5
Correct Staple Placement

source: Quinton, 1990



staple ends in the wood

source: Adams and Whyte, 1990



vertical placement on a post

Various in-line tension springs and wire strainers are used. The final tension applied is 114 kg (250 lb) at temperatures of 10 to 20°C. After tensioning, you will need to adjust fence tension occasionally: after a freeze/thaw cycle, when trees fall on the wire, etc. Tension can be set easily on smooth wire fences using the in-line tension devices. Adjusting tension on barbed wire fences is more difficult, since it usually involves pulling out the staples on the line posts first.

Step 8. Install droppers

Droppers act as wire spaces, help distribute the load on the fence, and add visibility and stability. They are made of metal or wood and are snapped, stapled, or wired firmly on the fence wire. Place the droppers up to 3 m (10 feet) apart, depending on the estimated livestock pressure on the fence.

Step 9. Incorporate gates where needed

You may need to install gates to provide access to certain areas. Each gate should be hinged and at least as high as the fence. Gates can be purchased or built from wire, steel pipe, and pivots.

FENCE MAINTENANCE

Fences built to agricultural standards usually require very little maintenance. Occasionally, you may need to tighten slack wires or remove any trees that have fallen across the fence. Also, remove any debris that has accumulated, especially at watering points and livestock crossings. Over time, you will need to replace any sections of fence that are undercut by the stream or loosened by frost heaving or flooding.

Collecting, Reporting, and Evaluation Information

Send a copy of the Stream Fencing Summary Sheet to the Streamkeepers Database. The current address is listed in the Handbook. When your fence is finished, follow up with the maintenance plans agreed upon between the landowner and your group.

Some benefits of fencing are apparent soon after a fence is built, especially if stream bank planting is done at the same time. Water quality may improve first, because fencing deters erosion and animal waste additions. However, it takes a long time for stream banks to recover completely. It may take a few years to restore water temperatures and fish habitat. Water quality, benthic invertebrate, and juvenile fish surveys (Modules 3, 4, and 11) are the monitoring techniques most likely to provide evidence of improvements on the stream. You may wish to conduct these surveys when you install the fence and again in subsequent years to monitor improvements in water quality and stream habitat.

Public Relations

You can clean up streams, monitor their condition, and undertake enhancement projects, but you need the support of your community for these projects to succeed. Talk about your project with others whenever and wherever you can, including at schools and public meetings. Place signs at visible projects. Contact newspapers, radio stations and television stations. Module 10 contains specific information about increasing community awareness and working with the media.

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send the data to the Streamkeepers Database

MODULE 8: STREAM FENCING SUMMARY SHEET

(See Module 1 for additional information)

Stream Name/Nearest Town	Date
Organization name and municipality	Crew size
Contact name	Phone #

Upstream boundary of work (directions, distance to known landmark)
Downstream boundary of work (directions, distance to known landmark)

How long is the fence?
what type of fence is it?
Comments