Building an Electric Antipredator Fence

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Two factors have led to curtailment of some lethal methods of combating sheep predators and have limited the use of others: changes in public attitudes and more restrictive state and Federal regulations. Ranchers are finding increasing emphasis placed on nonlethal methods for reducing losses of sheep to predator attack. Recent tests of electric fences in Oregon and other western states have shown that fencing can be a useful, nonlethal control tool.

Fences using only electrified wires generally have alternate strands of hot and ground wires. Wires are charged by electric fence controllers connected to 115-volt a.c. or 12-volt batteries. Prototype fences had 12 wire strands, but now most electric fences use only 7 or 9 wires (figure 1a and 1b).

Intensive testing in Idaho and North Dakota revealed that fences with 12 strands absolutely prevent access by coyotes. Surveys of ranchers using 4- to 9-strand fences indicate that these fences enjoy a similar success record (table 1) in Oregon. Offsetting 2 or 3 electric wires from 39" livestock fencing is an economical and effective method for renovating existing fences (figure 2). The offset wires carry a positive charge, and the livestock fencing is grounded to complete the circuit. Sheep growers in Oregon report that losses have been reduced 80 to 100% by this fence.

Another modification, offsetting 1 hot wire at the top or bottom of a predator-directing fence, is used in a few situations in western Oregon, where coyotes learned to climb over or dig under this type of barrier fence (for details on barrier fences, see Oregon State University Extension Circular 916, Fencing Against Coyotes). Once the hot wire was placed at the top or bottom of the fence and the net portion was grounded, losses stopped.

Electric fence systems are safe. Because the electric current is on for such a short time, little hazard is posed to humans. Normally, there is no danger of starting fires in forested areas. However, as with any electrical device, you must treat these fences with respect and caution. Best results are obtained using fence controllers that generate 4000 to 5000 volts of line pressure and have a current flow time of about 1/1000 of a second.

### Building the fence

Building electric fences represents a long-term investment. Proper fence construction will reduce future maintenance and fence failures. A survey of western sheep growers using electric fences revealed that many fences were poorly constructed at gates, end posts, and corner posts: some were falling only a few years after construction.

Electric fences use double-span strainer assemblies (figure 3) at gates, end points, and at intervals of 1500' to 2000' on long

### Table 1. Effectiveness of electric fencing to reduce sheep losses to coyotes and dogs

<table>
<thead>
<tr>
<th>Adaptations to mesh fences*</th>
<th>All-electric fences*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loss before</td>
<td>Loss after</td>
</tr>
<tr>
<td>Percent loss</td>
<td>n</td>
</tr>
<tr>
<td>6.7</td>
<td>120</td>
</tr>
<tr>
<td>12.5</td>
<td>120</td>
</tr>
<tr>
<td>31.9</td>
<td>320</td>
</tr>
<tr>
<td>37.9</td>
<td>400</td>
</tr>
<tr>
<td>23.0</td>
<td>100</td>
</tr>
<tr>
<td>20.7</td>
<td>1500</td>
</tr>
<tr>
<td>22.1</td>
<td>427*</td>
</tr>
</tbody>
</table>

* 1 to 4 electric wires offset from existing livestock mesh fences.
* 3 to 9 wire all electric wires.
* Losses incurred the year prior to building the fence.
* Average of losses in years (2 to 3) after fence built.
* n = number of ewes.
* No sheep in pasture before building fence.
* Average values.
fences. Conventional corners have 2 double-span assemblies connected at a 90-degree angle (figure 4).

The newer single-span strainer assemblies, erected in the angle of the corner (figure 5), use fewer materials but are reputed to be as strong as conventional corners. Strainer assemblies are the source of support for the fence, so the fence will be as strong or weak as these assemblies.

The strength of fences depends on how well strainer assemblies are built. Anchor and brace posts should be 9' long, at least 6" in diameter, and have at least 10 growth rings. Spans should be 8' long and at least 5" in diameter if round or 4" x 4" if square.

Anchor and brace posts and spans should be pressure-treated. A good reference for treatment is Oregon State University Extension Circular 887, Selecting and Preserving Fence Posts.

Posts pressure-treated in accordance with Standard C5, American Wood-Preservers' Association (7735 Old Georgetown Road, Bethesda, MD 20814) will provide maximum service life. To avoid the potential problem of corrosion of the high-tensile fence wire, treat posts only with creosote, creosote solutions, or pentachlorophenol.

Place line posts at intervals between strainer assemblies to maintain spacing of wires and to hold the fenceline parallel to the ground contour, especially at dips and hillcrests. Place line posts 60' to 100' intervals on flat terrain, and at 20' to 40' intervals over wavy or irregular ground. Line posts (wood or fiberglass) should be 7' long and, if of wood, at least 5" in diameter and pressure-treated.

Batten or "dancer" posts are 5' lengths of fiberglass posts and are used to maintain wire spacing between line posts and between line posts and strainer assemblies. Place battens at 30' intervals.

Determine materials list

Make a sketch of the fenceline, locating strainer assemblies, line posts, battens, and gates. This will help in determining the materials needed for the fence support system and accessory materials. Examples of a typical fence (figure 6) and an accompanying list (table 2) detail the materials needed. Do not buy cheaper materials to save costs, or you will only shorten the lifespan of the fence. It is especially important to use properly preserved fence posts, triple-galvanized, high-tensile steel wire, and galvanized staples.

Prepare the fenceline

Remove all remnants of old fences, especially corner, end, and gate posts. The fenceline should be as straight as possible: avoid dips, bumps, and gullies—or level them if possible. The best and tightest fences
will be built where a bulldozer can be used to scrape out a flat, level fenceline.

Lay out materials for end, gate, and corner strainer assemblies and at other fence stress points (dips, hillcrests, long stretches between corners). Place them in approximate locations on straight lines.

**Build strainer assemblies**

It is essential that you bury anchor and brace posts deeply enough to provide maximum resistance to pulling out of the ground. Doubling hole depth results in 4 times the resistance of the fence to lifting out. A rule of thumb is that anchor and brace posts should be set at a depth equal to 10 times their diameter. For a 6” post, the buried depth should be 5’.

Dig holes for anchor and brace posts with an auger 1” to 2” smaller than the post diameter. Drive posts into the holes with tractor-mounted, hydraulic post drivers or with bulldozer blades. Driven posts may be up to 1½ times as resistant to sagging or lifting out of the ground as tamped posts. In some cases, the hole will be larger rather than smaller than the anchor or brace post (auger is too big; no auger available). You can still set the posts strongly by tamping with gravel.

**Single-span assemblies.** Dig the hole for the anchor post first, angled so that the top of the post will lean 1” to 2” away from the direction of pull. Drive or tamp the post; dig the hole for the brace post, with no lean, the length of the span away from the anchor post. See that all brace/anchor posts are directly on line and in line with other strainer assemblies.

Next, pin the span to brace and anchor posts. Place the span between the anchor and brace posts at the top, where it will be located when the assembly is completed. Drill a ½” hole through the top of the anchor and brace posts and 2” into each end of the span. Drive a 4”, galvanized, ½” steel pin halfway into one end of the span. Lift this end of the span and place the protruding pin in the ½” drilled hole in the anchor post.

Place the other end of the span so that the ½” hole matches up with the ½” hole at the top of the brace post. Drive a 10” long, ½” pin through the brace post into the span, leaving 2” protruding (figure 7).

Attach brace wires next. Cut 40’ to 50’ of the fencing wire. Nail a staple halfway in at the bottom of the back side of the anchor post (figure 8). Bend 3’ of one end of the wire back on itself to form a flattened loop and hook it through the staple. Lap the wire twice up over the protruding ½” pin at the top of the brace post and down through the staple.

After the second lap, bend the free end of the wire back around through the staple and pull to tighten the brace wiring. Cut off
### Table 2. Fencing materials and costs per section of typical pasture land (4 miles of fence line)

<table>
<thead>
<tr>
<th>Material Type</th>
<th>3-wire fence</th>
<th>7-wire fence</th>
<th>9-wire fence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gate and corner strainer assemblies (8)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6&quot; x 10' anchor/brace posts (16)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4&quot; x 8' spans (8)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>or</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Double-span assemblies (12)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6&quot; x 10' anchor/brace posts (36)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4&quot; x 8' spans (24)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brace wire, 9 ga</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inline single-span assemblies (8)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6&quot; x 10' anchor/brace posts (16)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4&quot; x 8' spans (8)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brace wire, 9 ga</td>
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<td></td>
</tr>
<tr>
<td>8' fiberglass line posts (225)</td>
<td>- 1160</td>
<td>- 1160</td>
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<tr>
<td>4' fiberglass batten posts (475)</td>
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<td>Wire clips</td>
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<td>12.5 galvanized fence wire</td>
<td>- 780</td>
<td>- 1800</td>
<td>- 2330</td>
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<tr>
<td>Barbed wire</td>
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</tr>
<tr>
<td>Insulators</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>porcelain</td>
<td>- 16</td>
<td>- 37</td>
<td>- 48</td>
</tr>
<tr>
<td>or insulated tubing</td>
<td></td>
<td>- 250</td>
<td>- 330</td>
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<td>Wire strainers</td>
<td>125</td>
<td>300</td>
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<td>Voltmeter</td>
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<td>Offset wire brackets</td>
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<td>Electric fence signs</td>
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<td>Wire sleeves</td>
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<td>65</td>
<td>80</td>
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<td>5-panel aluminum gate (2)</td>
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<td>72</td>
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<tr>
<td>Miscellaneous wires, poultry/livestock fence, etc.</td>
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<td>50</td>
<td>50</td>
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<tr>
<td><strong>Total materials cost</strong></td>
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<td><strong>5671</strong></td>
<td><strong>6347</strong></td>
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<tr>
<td><strong>Loan cost</strong></td>
<td>400</td>
<td>2250</td>
<td>2650</td>
</tr>
<tr>
<td>Bulldozer rental to clear 4 miles of fenceline</td>
<td>-</td>
<td>1200</td>
<td>1200</td>
</tr>
<tr>
<td><strong>Total cost</strong></td>
<td><strong>$3266</strong></td>
<td><strong>9175</strong></td>
<td><strong>10,310</strong></td>
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<tr>
<td><strong>Cost/mile</strong></td>
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<td><strong>2294</strong></td>
<td><strong>2578</strong></td>
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<tr>
<td><strong>Average cost over 20 years</strong></td>
<td><strong>30</strong></td>
<td><strong>115</strong></td>
<td><strong>129</strong></td>
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<tr>
<td><strong>Maintenance/year</strong></td>
<td><strong>10</strong></td>
<td><strong>25</strong></td>
<td><strong>25</strong></td>
</tr>
<tr>
<td><strong>Total cost/year per mile</strong></td>
<td><strong>$40</strong></td>
<td><strong>140</strong></td>
<td><strong>154</strong></td>
</tr>
</tbody>
</table>
Lay out and stretch wire

Use triple-galvanized, high-tensile, 12.5 or 13 gauge steel wire. If the wire comes on reels, you can mount the reels on a rod and pay them out from the back of a pickup truck (figure 10). Pay out as many reels as there are wires for the fence. If the wire comes in a bundle, place it on a “spinning jenny” (figure 11). You can buy or rent spinning jennies through fencing suppliers, electric supply companies, or power companies.

Never pull wire directly off a bundle— it will kink, ruining it. When you come to the end of a wire, tie on a new wire, using the figure-8 knot (figure 12) or splice wires with compression wire sleeves (figure 13). Compression sleeves require a special tool, which you can usually rent from fencing suppliers. Compression sleeves are much faster and easier than tying and don’t weaken the wire like tying. Three wire sleeves are used to crimp wires together.

Wire is usually not stretched over 2000' lengths, nor around corners, when the distance from the nearest stress point to the corner is over 500' to 1000'. Therefore, pay out wire to the corner or other stress point, cut, and lay out the next wire. Leave 3' to 4' excess wire at each end to allow for tying off.

Proper spacing on the wires is essential. The bottom wire is usually 5' above ground level and carries a positive charge. Thereafter, wires are alternately positive and ground at recommended spacing for 7- and 9-wire fences (figure 1). An uncharged strand of barbed wire, stretched tight at the ground level of the fence, discourages coyotes from digging under.

You can place a positively-charged “tripwire” 6' to 8' out in front of the fence, 6' to 8' above ground (figure 1) if you need an additional deterrent to keep coyotes from digging under or jumping over fences.

Tie positively-charged wires to anchor posts with porcelain insulators or plastic tubing. Use an anchor post knot (figure 14) or a wire sleeve. If you use tubing, thread wire through about 2' of the tubing and tie around the post, again using the anchor post knot or wire sleeves.

Tie ground wires directly to anchor posts (they don’t need insulators). Make sure wires that will carry positive charge are insulated from anchor, brace, and span posts. Use short (4” to 6”) sections of plastic tubing to insulate positive wires from the fence components. Thread the wire through the tubes first before tying it off at anchor posts.

When you insulate all (positive and ground) wires from posts and spans with tubing, you build flexibility into the system—you can make any combination of positive and ground wires. All wires, or lower wires only, may carry positive charge. When the ground is wet, grounded fence wires may not be necessary; all wires can carry positive charge.

Staple positive wires (inside tubing) and ground wires to posts, using galvanized staples. Nail the staples diagonally to the grain of the wood and staple loosely enough to allow the wire to move freely through the staples. Nail them just tightly enough to the tubing to prevent it from moving and exposing the wire to contact with the fencepost.

When you stretch wire around a corner instead of tying it off, use tubing (but only on round corner posts—square corner posts will dig into the insulation, eventually causing it to fail) or porcelain insulators attached parallel to the corner (figure 5). Maintain proper spacing of wires around corners with staples if tubing is used.

Tie wires to anchor posts, leaving slack in the wire. Leave a 6’ “tail” at the end of cut wire for attachment of connector wires.

Wire must be stretched to achieve a desired tension (usually 200 to 250 pounds) so that if the fence is hit by an object, it will return to its original configuration. Place
Figure 15.—Wire strainer

POSTS POSITIONED CORRECTLY

POSTS POSITIONED INCORRECTLY

Figure 16.—Proper placement of line posts on contour lines

Figure 17.—Tension meter

wire strainers (figure 15) in the middle of uninterrupted stretches of wire.

To install a strainer, cut the wire and tie one end to the strainer with an anchor post knot or a wire sleeve and thread the other end in the reel of the strainer. When you have connected all wires to strainers, tighten the wire until taut, using a special ratchet tool. Lay out and tighten wires for all sections of the fence.

Place and set line posts

Seven-foot fiberglass line posts are generally used. They do not require insulators. Set line posts at approximately 60' to 100' intervals and drive them 18" into the ground. Seven-foot pressure-treated wood posts may be used, but they will require insulation for positively-charged wires. fiberglass posts are preferred, especially on level ground.

If the ground is not level but has contours 3' or more below the fenceline, use wood line posts (they have a lower tendency to pull out). Place 5' fiberglass batten posts at 30' to 50' intervals between line posts. Do not bury batten or "dancer" posts in the ground; use them to maintain spacing of the electric wires.

Make sure line posts are set directly on line between strainer assemblies. When the contour of the fenceline is not flat, position line posts perpendicular to the surface of the ground where the post will be placed (figure 16). Do not place the posts parallel to each other over contoured land (figure 16) — you won't be able to maintain proper spacing of wires.

Sometimes line posts go into the ground at an angle, or they are later found to be out of line. They are difficult to take out, but small jack-type tools will pull out an improperly placed fiberglass post in seconds (available at fencing dealers).

Place proper tension on wires

You can make a simple meter to measure wire tension (figure 17). Make it from scrap 1" x 2" hardwood, placing 2 pins (wooden dowels) 40" apart at the ends of the meter. Place a mark on the top of the meter, ½" down perpendicular from a line drawn halfway between the 2 pegs. To tension the wire, place the meter halfway between the line strainer and a strainer assembly.

Attach a small spring scale at the midpoint of the wire on the meter and pull the wire down to the half-inch mark. The wire is properly tensioned when the spring scale reads 9 to 10 pounds. Tighten wires at inline strainers until the proper tension is achieved. Recheck for proper tension after a week or two to take up any "give" in the fence. Check again in a month or so.

Make electrical connections

Strong, positive connections with electrical wires are essential. All positively-charged wires need to be connected together, and all ground wires need to be connected together at all breaks in the wire (excluding wire strainers), as shown in figure 1. Such locations are at end and gate posts, and at the ends of long stretches of wire at inline strainer assemblies. Make connections with galvanized steel wire (using copper, aluminum, or other wire causes corrosion and eventual failure of wire). Make sure positive and ground wire connectors do not cross.

Ground wires must be earth-grounded at the location of the charger and also at every ½ mile of fenceline. You do this by driving 4 galvanized steel posts 5' to 6' into the ground, 6' apart, and attaching the ground lead from the fence to the posts with pipe clamps. Wet seeps or other damp areas provide maximum grounding. Never place ground rods inside buildings.

Attach wires to inline posts

If you use fiberglass posts and battens, simply clip the wires to the posts, using the small metal wire clips provided. If you use wooden posts, thread plastic tube insulation on the wire and staple it firmly to the line.
posts. Make sure that the wire inside the tubing can move freely from side to side. Staple ground wires loosely to wooden fence posts. Maintain the spacing of the wires on these inline posts and battens.

Gates

The easiest type of gate to install is the standard 5-panel aluminum gate. You can wire livestock/poultry fencing to the gate to prevent coyotes from digging under the fence (figure 18). You can set a concrete sill (4’ x 6” wide, 18”, deep) under the gate to prevent coyotes from digging under the fence. Bolt ¾” metal rods to the top of the gate at the ends and bend them out at a 60-degree angle. Bend the livestock/poultry fencing out, away from the top of the gate, and attach it to these rods to prevent coyotes from climbing over the fence.

A cheaper solution consists of stringing positively-charged wires between the gate panels and insulating them from the gate with plastic tubing. The aluminum gate can be connected to ground.

Carry current over the gate on a frame with insulated wire or bury it under the gate in PVC pipe. If you bury it, be sure to use insulated wire. If you use insulated tubing to carry bare wire under gates, face the tubing downward at the point it connects to the hot wires on the fence, to prevent water from pooling in the tubing and shorting out the fence.

You can also construct electric wire gates (figure 19), but they are less rigid and take less punishment than the panel gates. You must also carry the current across the gate, and this is an additional point where a breakdown in transmission of current can occur.

Adapting existing livestock fence

Many growers have found that adding 2 to 3 strands of hot wire outside existing conventional livestock net fencing stops predation. It is certainly an inexpensive addition.

The wires are usually offset 6” to 8” from the top, bottom, and middle of the fence to stop coyotes from climbing over or through or digging under existing fences. You can purchase offsets (figure 20) that clip on to the net fencing, or make your own. Slin an 8” section of ¾” PVC pipe parallel to one end to a depth of ¾”.

Place the wire in the slit and insert a nail in the pipe between the wire and the slit to hold the wire to the insulator (figure 21). Secure the pipe to wood fence posts by 2 14-penny common nails driven through holes drilled in the PVC. The lifespan of these homemade offsets is unknown, but they have lasted at least 5 years on some fences in Oregon.

Connect wires to anchor posts in the same manner described for positively-charged wires on all-electric wire fences. Do not set strainer span assemblies for livestock fencing to take the wire tension of all-electric fences. The electric wires on these adapted fences do not need to be protected as much against loss of configuration, so the tension does not need to be set very high.

Often ranchers simply attach the wires and tighten with wire strainers until all slack is taken up from the electric wires. Ground the net portion of the fence to insure maximum shocking effect. Ground every ¼ mile of net fencing in the same manner described for all-electric wire fences.

Selecting and placing electric controllers

The heart of electric fence systems is the controller. Use only high quality, high-output controllers. Protect the controllers from weather, animals, and curious people as much as possible. The safest and most protected locations are inside barns, sheds, or other utility-type buildings. If you can’t use structures like these, build small houses for remote units that blend into the background and are well insulated from wind and precipitation.

The controllers are reputed to hold charge on 50 miles of line (for a 7-strand fence with 4 hot wires, one controller could charge approximately 12½ miles of fenceline). For fences where the sum length of all hot wires exceeds 50 miles, install additional controllers. Be sure that sections of fence operated by different controllers are not connected together electrically.

Attach the positive lead from the controller directly to one of the hot wires, which in turn is connected to all other hot wires (figure 1). The ground lead from the controller is attached to one of the ground pipes in a typical grounding assembly, which in turn is connected to all ground wires on the fence (figure 1).

It is essential that you keep proper voltage on the fence at all times. Use small, inexpensive voltmeters to check the voltage daily. A drop in voltage to below 1000 to 2000 volts indicates a short in the system that must be investigated. Some ranchers install the voltmeter alongside the controller and leave it permanently attached to the line for easy inspection.

Dips, gullies, and streams

Maintain spacing of wires at dips, gullies, and streams—or coyotes will cross the fence at these potential weak links. For small dips (usually less than 2’ deep and 6’ across), you can connect the wires together (insulated from each other), pull them down to and tie them at a metal stake driven 4” into the ground at a 45-degree angle (figure 22).

Gullies present a larger problem; you won’t be able to pull down the wires of an electric fence far enough to seal off the gully. Continue the fence over the gully and fill the gap with a continuation of the electric wire fencing (figure 23).

Coyotes use stream beds and banks as travel routes; you must maintain fence integrity at these locations. Build the fence line right to the banks of the stream on both sides, using strainer assemblies on each side to anchor the fence.

To block coyotes from the fence line in the stream, bridge the gap above the water with electric wires or poultry/livestock fence. Attach a top-hinged, self-cleaning floodgate to the bottom of the fence line (figure 24). Wire tightly-strung barbed wire or poultry/livestock fencing to the floodgate. If you use poultry/livestock fencing to span the gap...
above the stream, carry the current over the stream on a system of stout poles.

**Miscellaneous tips**

One of the commoner sources of loss of charge on a fence is grounding by wet vegetation. As needed, clear the fenceline of herbaceous vegetation, either with an herbicide or one of the handheld weed cutters. If you use herbicides, the soil sterilants atrazine, simazine, and diuron are good choices.

Atrazine works best in areas with less than 20" of rainfall annually, whereas the other two are more suited to high rainfall areas. These herbicides work best when applied in early spring, but if green foliage is present at the time of treatment, you can add amitrole.

Use 20 to 40 pounds of 80% atrazine or simazine or diuron in 40 to 100 gallons of water per acre of untreated area. Followup applications require only 4 to 10 pounds per acre. If you use amitrole also, add 2 pounds to the other chemical in 40 to 100 gallons of water.

None of these herbicides should corrode galvanized, high-tensile fence wire. Glyphosate does cause corrosion; do not use it.

Sometimes it is difficult to locate the source of a short on a fence. You might install cutoff switches at various intervals along the fence, such as at gate locations (figure 19), to segregate various segments to test for the short. Pinpoint shorts by using a transistor radio tuned so only static is heard. As the radio is brought close to a short, it produces audible clicks.

Because of the high voltage generated by the electric controllers, you'll need to nullify the potential for arcing by avoiding metal-metal contacts. One place arcing occurs is between steel fence posts and positively-charged wires. Elimination of steel fence posts from the fenceline will greatly reduce the already small hazard of a fire.

Another source of grounding is windfall from trees near the fence. Inspect all trees close to fencelines for limbs that may be hanging over the fenceline; these could fall and cause the fence to short out. Remove these limbs.

Occasionally livestock will rub on the fence's brace, anchor, and line posts; this can be a problem to corner angle assemblies. You can eliminate this rubbing by stringing a hot wire along the strainer assembly and insulating it from the frame.

In areas where snowfall is a regular occurrence, maintain your fence's effectiveness simply by removing the charge from the lower positively charged wires as the snow depth builds so that charged wires are always above the level of the snow. You should place electric fence signs on your fence at intervals of 200', especially in areas where the fence is close to public roads.

Although you can use barbed wire effectively at the bottom of a fence to keep coyotes from digging under, do not use it to replace the high-tensile wire that carries positive or ground charges. Barbed wire usually will not take the tension required for electric fences.

**Costs**

The cost of materials is difficult to reduce. Quantity buying by several individuals may help. Use of lower-quality materials is not recommended; they could increase maintenance costs and shorten the lifespan of the fence.

Labor has been calculated into the estimated costs below. Labor cost varies with the labor force available and the type of terrain to be fenced. Family labor reduces the cash outlay, but the actual cost of family labor varies for each operation and must be assigned a dollar value.

Labor costs may approximate $1,400 per mile. Maintenance costs on these fences will approach $140 per mile annually, based on 20 hours of maintenance at $4.00 per hour, plus $20.00 for vehicle and supplies and $40.00 for herbicides.

**Determining feasibility of fencing**

Predator fencing must pay for itself to justify its use. The following calculations will help you decide if your sheep losses caused by dog and coyote predation are high enough to justify building a fence. Calculations are based on a 20-year life expectancy for the fence and the assumption that predator fencing will nearly eliminate losses to predators.

- Number of sheep that must be saved each year to justify costs

\[
\text{Ownership cost of fence per year} = \frac{\text{Ownership cost per year}}{\text{Value of sheep per head}}
\]

- Ownership cost per year
  - Cost of fence per year
  - Annual interest on investment
  - Operating costs per year

**Example:** Fence one section, requiring 4 miles of fencing with 9-wire fence, assum-
ing a 15% interest rate and an average value of sheep is $60.00.

a. Fence Materials, bulldozer $ 7,660
   costs: Labor $ 5,600
   $13,260

Fence cost per year = $13,260
20 years
= $663 per year

b. Annual interest on investment = average investment x interest rate
   Average investment = fence cost
   2
   = $13,260
   2
   = $6,630

   Interest rate = 15%
   Annual interest on investment = $6,630 x 15% = $995 per year

   Operating costs
   = maintenance cost/mile + herbicide cost/mile
   = $140/mile, 4 miles of fence = $560 per year
   Ownership cost per year + $663 + $995 + $560 = $2,218
   Number of sheep that must be saved each year to justify cost of fence
   = $2,218
   $60
   = 37.0 sheep

   Thus, if you grazed sheep in a 1-section pasture and had losses averaging more than 37 sheep a year, you could justify building the fence.

   Assuming the 7- and 9-wire fences both nearly eliminate losses, it is more economical to build the 7-wire fence. However, the 9-wire fence is 20" taller and will better eliminate losses by coyotes that jump over fences. Many sheep growers prefer the extra margin of safety afforded by the 9-wire fence for a slightly higher fence cost.

   You may wish to enclose a small pasture with an electric fence and use it as a night-holding pasture, as a lambing pasture, and/or a pasture for use when predation losses are expected. This will reduce the amount of land enclosed by the fence, resulting in lower fence costs, but this arrangement will not protect your sheep full-time.

   Ownership costs:
   a. Fence Materials, bulldozer $ 7,660
   b. Labor $ 5,600
   c. Maintenance cost 4 miles of fence $ 360

   Total ownership cost = $13,260

   Cost per year = $663

   Interest rate = 15%

   Annual interest = $995

   Total annual cost = $2,218

   Number of sheep that must be saved each year to justify fence costs:
   $2,218
   $60
   = 37.0 sheep

   Thus, if you grazed sheep in a 1-section pasture and had losses averaging more than 37 sheep a year, you could justify building the fence.

Predator fencing is an alternate method for protecting livestock from coyotes, but the potential of fencing must be evaluated for each livestock operation. Fencing is not applicable to all operations, especially trailing sheep on open range, but it has been economically justifiable to farm-flock producers in the Pacific Northwest. Even where electric fencing is used, the need for lethal control methods exists. Occasionally a coyote will get inside an electric fenceline and kill sheep. You can easily control these coyotes with traps and snares or by shooting.

### Useful references


The Waterford Corporation. The procedure for erecting the modern high tensile electric fence (mimeo). P.O. Box 1513, Ft. Collins, Colo. 12 pp.


### Suppliers of fencing materials

This list of suppliers of electric fence components (primarily controllers and wire) does not represent endorsement by the Oregon State University Extension Service, nor is the list exhaustive. The suppliers have local distributors who may be identified by contacting the main supply offices.

Kiwi Fence Systems, Inc., R.D. 5, Box 122, Waynesburg, PA 15370 (412) 627-5640

Live Wire Products, P.O. Box 53, Rough & Ready, CA 95975 (916) 432-1220

Snell Power Fencing Systems, Inc., P.O. Box 17769, San Antonio, TX 78217 (512) 494-5211

Waterford Corporation, P.O. Box 1513, Ft. Collins, CO 80522. (303) 482-0911
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