

Fencing Options to Mitigate Wildlife Damage

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Introduction

Loss of income caused by wildlife damaging or destroying crops, is a perennial and serious problem faced by many farmers. Deer foraging on vegetable crops or buds in orchards, bears destroying bee hives and raccoons ravaging corn are just some of the challenges faced by farmers.

Fortunately, there are fencing solutions for high value crops that can greatly help reduce or eliminate this type of damage. Unfortunately, due to its cost, fencing is generally not an affordable option for large acreages such as wild blueberries or field corn.

This factsheet provides an introduction to various fencing options available to help mitigate damage to high value agricultural crops caused by wildlife.

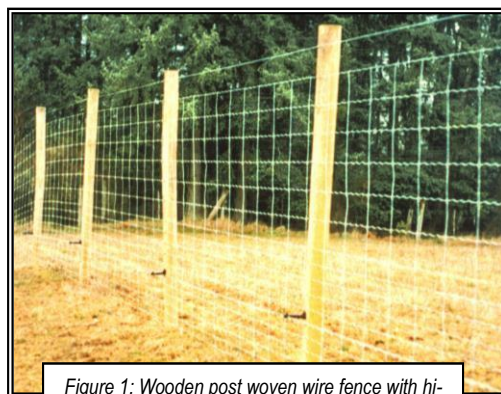


Figure 1: Wooden post woven wire fence with high-tensile wire (HTW) on top

Choosing the right fence for year-round protection:

A farmer has many options to choose from. In general, the level of mitigation achieved corresponds to the cost of the option chosen. The choice will be driven by the farmer's budget, the value of the crop being protected and the specific wildlife being controlled.

- 1) **Woven wire** (also referred to as page wire): This fencing system is the most effective and the least costly to maintain, but is also the most expensive (**Figures 1, 2**). **If the woven wire system is selected**, there are several further options to consider.



Figure 2: Steel post (3 1/2") T-Rail woven wire fence

- a. Knots: There are two types of knots, the knotted joint (**Figure 3**) or the hinge joint (**Figure 4**). These knots tie together the vertical and horizontal wires.

The knotted joint provides greater stability to the fence because the vertical wire is kept from sliding sideways. The vertical wire in the hinged joint can slide sideways easily. However, the knotted joint wire is more expensive.

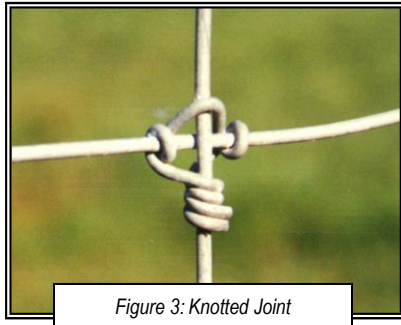


Figure 3: Knotted Joint

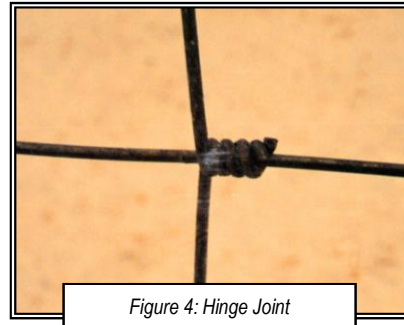


Figure 4: Hinge Joint

b. Wire spacing: Various spacing options are available for both the vertical and horizontal wires. The spacing chosen will depend upon the type of wildlife or domestic animals being controlled.

c. Fencing supports: Two different types of support systems are commonly used. A wooden post system, preferably pressure treated or cedar posts (**Figure 1**) and a galvanized steel post/ T Rail system (**Figures 2 and 5**). Cost wise, there is little difference between the two. However, the wooden post system tends to be the stronger of the two, especially when there are side pressure issues, either from wildlife, domestic stock, heavy winds and snow or from falling branches or trees (**Figure 6**).



Figure 5: T Rail and wire ties used to hold woven wire against the T rails

2) **Hi-Tensile Wire (HTW)**: Multiple strands of HTW (**Figure 7**) either electrified or non-electrified and using a wooden post support system is another option. An electric HTW fence is much more effective than one without electricity, however, weeds must be controlled, either by intensive grazing or by mechanical/ chemical means. Initially, the HTW system is cheaper to install, but in the long run, maybe more labor intensive to maintain.



Figure 6: Steel post / T Rail system – damage from heavy snow load & moose (courtesy CBC)

- 3) **A combination of both woven wire and HTW:** This option uses a wooden post system, with woven wire on the bottom 4' and multiple strands of HTW, (electric or non-electric), above the woven wire. As mentioned above, the electric option is much more effective. Weed control is not a concern with this option, because the firststrand of electric fence is over 4' above the ground.



Figure 1: Multiple strands of HTW

- 4) **Plastic woven fencing:** This is a low cost investment option and can be very effective in a low deer pressure area (**Figure 8**). This system can utilize either the wooden post or steel post/ T rail system; however the diameter of the wooden posts can be much smaller - 2 to 3”.



Figure 8: Plastic woven fencing

Fencing Options to Mitigate Deer Damage in orchards:

There are various fencing options available for the control of deer. The options vary, based on the type of crop to be protected and the level of deer pressure that exists in the area. Once these factors are determined, the height and type of fence can be selected.

Orchards and vineyards are potential food sources for deer, especially in winter months. Fencing to protect these crops needs to be a minimum of 8' high. Protecting vegetables and small fruit during the growing season when other food sources are present may only require a 4' high fence with a strand of electric wire on the top. Various options exist to provide protection. Some are noted below.

- Woven wire offers the most secure solution. Often a single strand of electric fencing will be added on top of the woven wire, as shown in figure 1. This increases the effectiveness of the fence, especially in winters with deep snow.
- Multiple strands of electric high tensile wire (HTW) provide a good solution as well; however, more maintenance is required when dealing with an electric fence. HTW without electricity is sometimes used, but the fence is not as effective, once the deer learn they can jump or squeeze through it without receiving a shock.
- A combination of woven wire on the bottom 4' and HTW on the top is another option. Again, the electric version is much more effective. Any of the above three options should provide a fence life expectancy of 25 – 30 years.

- A lower cost option is the use of plastic woven fencing material, but this type of fencing is usually recommended in lower deer pressure areas. This option has a fence life expectancy of 10 – 15 years.

Fencing Options to Mitigate Bear Damage:

Because bears hibernate, winter damage to orchards and other crops is not an issue. During the growing season, however, bears love to forage on blueberries, raspberries, dropped apples and honey from beehives. Bears also do considerable damage in wild blueberry, corn and grainfields by lying down and rolling in them. However, due to the size of the fields involved, these types of fields are generally too expensive to fence.

- Properly installed fencing to exclude deer will also generally exclude bear, unless a highly desired food source is near the fence on the opposite side. Bears are known to climb woven wire fences to get to beehives. However, one or two strands of electric fence or barbed wire above the woven wire will generally offer effective protection.
- A 4' high portable electric fence is also very effective in protecting beehives from bears. However, the electric fence must be 6 – 8' away from the hives, so the bears cannot reach over the wire to the hive. Once a bear gets the taste of honey from a hive, the electric shock is no longer a sufficient deterrent.

Fencing Options to Mitigate Raccoon Damage (and other small animals):

Perhaps more than any other type of wildlife, raccoons are the bane of small fruit and vegetable growers. They have the uncanny ability to know when sweet corn is ready to harvest and can destroy the crop very rapidly. The same is true of other small fruit and vegetables that racoons enjoy eating. Fortunately, damage from these small animals can be mitigated.

- A temporary electric fence with two strands of wire placed strategically low to the ground (**Figure 9**) has proven to be very effective. However, vigilant maintenance of the electric fence system, including weed control, is essential as raccoons seem to detect exactly when the system is not working properly.
- Another effective system is the use of 2' high electric netting. Likewise, maintenance and weed control is essential for this system to be **effective**.

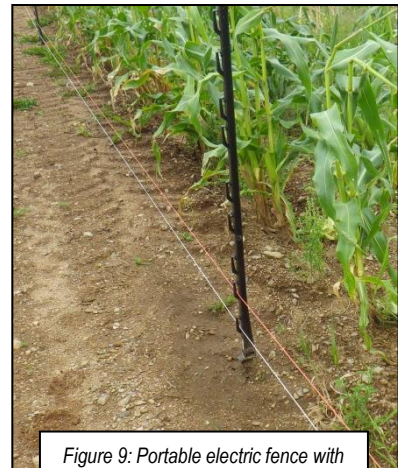


Figure 9: Portable electric fence with two low strands

Fencing options to help prevent deer damage to vegetable and small fruit crops:

The construction of the 3- Dimensional Deer Fencing should be done using a poly tape electric wire to add high visibility. The corners and angle posts should be of rigid construction, preferably with “T” rails post spacing 20-30’. The inside fence should be constructed 36” from the outside fence.

Inside Fence: A double inside fence which includes a wire at 18” and a minimum 32” top strand.

Outside Fence: A single strand outside fence at approximately 24”.



Figure 10: 3-Dimensional Deer Fencing

MUST do steps to ensure success:

- 1) All fences MUST be installed and energized prior to planting.
- 2) The outside single strand should be baited and maintained with strips of tinfoil and peanut butter or another attractant.
- 3) Maintain an adequate distance (at least 6’) between the fence and the woods where the deer will encounter the fence. The deer must be able to come out into the open, assess the fence and be able to turn.
- 4) Maintain weed free ground or low cut, under and outside the fence.
- 5) ALWAYS, keep the fence on, and gates CLOSED even when working inside the field
- 6) When the field is all harvested, **You MUST keep the gates closed and the electricity ON**, until you remove the fencing. Otherwise, you will NOT have control over the deer the following year.

Woven Wire and HTW Installation Notes:

There are many excellent videos and step by step instructions on how to install all the various types of fencing. Some of these are included in **Appendix B**. Listed below are a few highlights that may be useful.

- 1) Posts of all types used for permanent fencing, regardless of the fence height, should be buried in the ground 3 - 4’. Corners, ends and brace posts should be buried 4 - 5’ where possible.

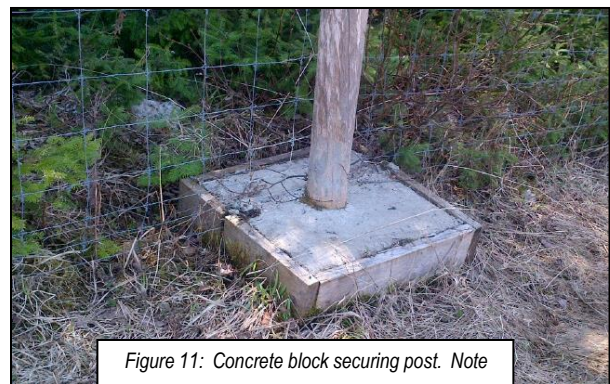


Figure 11: Concrete block securing post. Note bottom wire in concrete

- If you run into ledge or rock there are several options available. These include:
 - i. Drill the rock and insert a steel post or T

Rail.

- ii. Pour a concrete block around the base of the post (**Figure 10**). First drill through the bottom of the post, insert a rebar, then tie additional pieces of rebar horizontally to this piece in order to form a "rebar mat". Make a form using 2" by 8" or 10" lumber as seen in the picture. Then pour the concrete.
- iii. Use other bracing anchors such as duck bill and cable anchors.

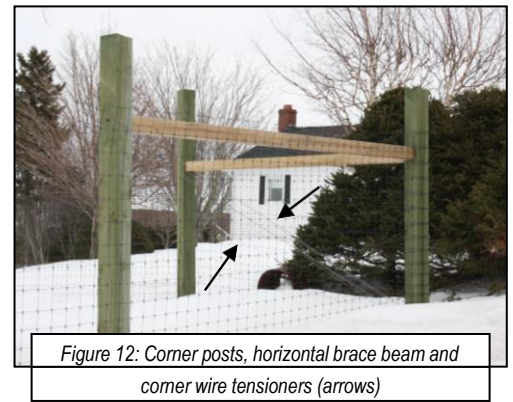


Figure 12: Corner posts, horizontal brace beam and corner wire tensioners (arrows)

- 2) Brace and corner posts, (**Figure 11**) 6 - 12" in diameter are spaced at 16' for an 8' high fence, 12 - 14' for a 6' fence and 10' for a 4' high fence. The horizontal brace posts can range between 4 - 6" in diameter. The length is determined by the brace post spacing.
- 3) Wooden support posts, 4 - 6" in diameter are placed 20' apart, while T Rails are placed 10' apart. The length of the posts is simply the height of the fence, plus four feet.
- 4) Driving posts into the ground is best done in the spring, when the ground is still soft. By summer's end, the subsurface can become very hard, making it impossible to get the posts deep enough into the ground without using additional mechanical tools.
- 5) Bracing and all anchor points must be firm and strong to achieve a long lasting fence. Used telephone poles make excellent bracing and corner posts.
- 6) Bracing points (**Figure 12**) should be no further than 660' apart from each other. When a straight run of a fence is greater than 660', then a bracing point should be installed.
- 7) When stretching woven wire, make sure the dimples are not stretched too far. **Figure 13** About 1/2 of the dimple should still be visible when stretching is completed.

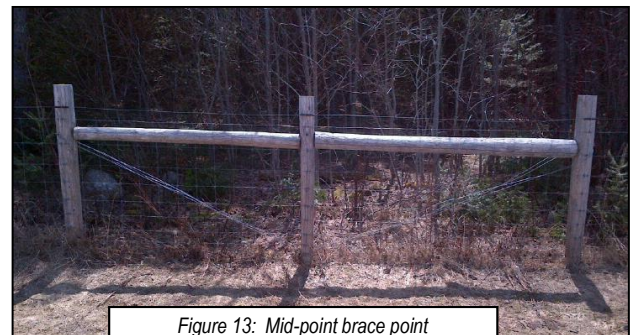
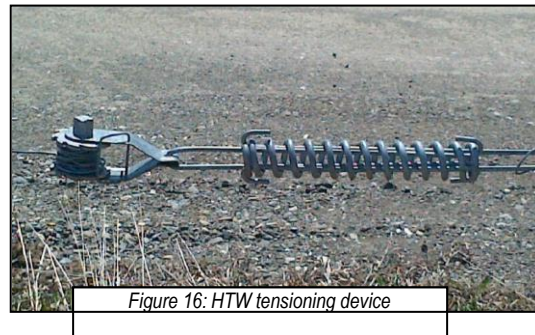
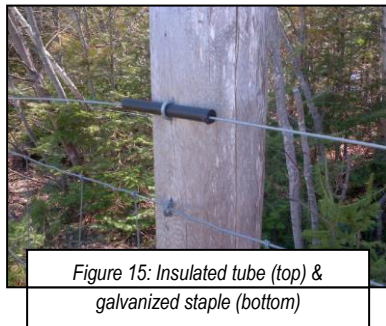
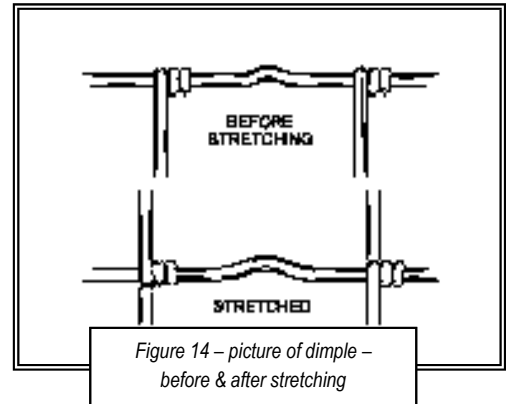


Figure 13: Mid-point brace point

- 8) Stapling woven wire and HTW to posts should be done in such a way that the staples do not pinch the wire (**Figure 14**). The wire must be free to flex between anchor points. This prevents permanent stretching or damage from impacts to the fence eg. branches or trees falling on it.
- 9) Tension on HTW, electric or non-electric, should be released during the winter months and then retightened during the spring (**Figure 15**).



Electric Fence Design Notes:

The use of electric fencing can be a very effective tool in preventing wildlife damage to agricultural crops. This factsheet highlights some of the essential basics to understand, but we strongly recommend you contact a professional in this field to make sure all pertinent points are considered.

- 1) It is critical that the correct charger size be selected. One key factor in determining the correct size is based on the total feet of wire to be charged, not just the overall length of the fence (*i.e. total perimeter of the fence is 2000' but there are two strands of electric wire. This means you are charging 4000' of wire.*) Also the type of livestock to be fenced in or the wildlife to be excluded helps determine the size needed.

- 2) One of the most important considerations when designing the electric fence system is to make sure the grounding system is sufficient. Many systems fail because the grounding is not properly designed for the application. **(Figure 16)** A number of factors influence what type of grounding system is needed, including soil type, sub-surface moisture and total length of fence, etc. Failure to provide sufficient grounding will result in the wildlife not receiving a sufficient shock to deter them.

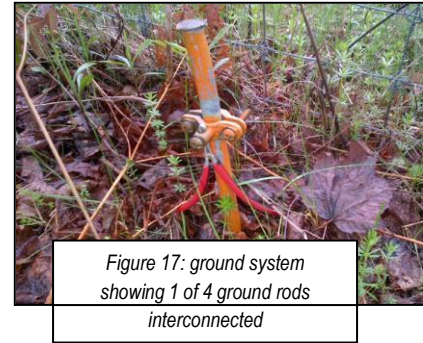


Figure 17: ground system showing 1 of 4 ground rods interconnected

- 3) Power source options include normal 110V power sources or solar powered batteries (often used in remote locations).
- 4) In order to enhance the effectiveness of an electric fence in controlling wildlife, such as deer and bear, place some bait (ie: peanut butter, bacon fat) on a tin plate mounted on the wire or attached directly to the wire. When the animal sniffs this bait or attempts to eat it, it receives a sufficient shock to discourage it from coming close to the fence again.
- 5) **Important Note:** If the fence is not properly grounded, a voltage meter may still show enough voltage to provide a good shock, however, the recipient animal will only receive a weak shock. Professional advice is recommended in this matter.

Other Typical Fencing Materials Used

- Staples: 1 ¾" long hot-dipped galvanized and double barbed.
- Wire splices: also known as crimp sleeves. Used on both woven wire and HTW. **Figure 17**
- Gripples: Another wire splicing device which also tightens the wire.
- HTW tightening devices: heavy duty compression spring and framed spring clip tightener. **Figure 15**
- Insulated tube: used to mount HTW wire. **Figure 14**
- Brace pins: hot-dipped galvanized 5 – 10" pins. These are used to anchor the horizontal brace beam in place.

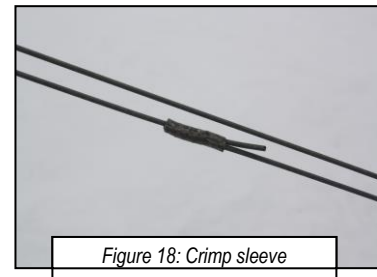


Figure 18: Crimp sleeve

Appendix A: Typical Materials List

Fencing Option Details: (listed in descending order, from most effective to least)

- A)** – 8’ woven wire with wooden posts and brace beams (**Figure 1**)
- B)** – 8’ woven wire with steel posts, steel diagonal braces and T Rails (**Figure 2**)
- C)** – 8’ electric high tensile wire (HTW) with wooden posts and brace beams (**Figure 7**)
- D)** – 8’ high combination of woven wire bottom 4’ & electric HTW top 4’ with wooden posts, braces
- E)** – Same as D without electricity on the HTW
- F)** – Same as C without electricity on the HTW
- G)** – 8’ plastic woven wire and wooden posts and diagonal bracing (**Figure 8**)
- H)** – Same as A only 6’ high
- I)** – Same as B only 6’ high
- J)** – Same as D only 6’ high, bottom 4’ woven wire, top 2’ electric HTW
- K)** – Same as A only 4’ high
- L)** – Same as B only 4’ high
- M)** – Same as C only 6’ high

Option #	PT fence post	PT brace beam	PT end post	Galvanized woven wire	Galvanized brace pins	Plastic woven material	Crimp sleeves	Galvanized staples	3 1/2" Steel posts	Steel brace pieces	T rails	Wire ties	HTW	HTW insulated tubes	Electric fence charger
A	12'	16'	13'	8'	yes		yes	yes							
B				8'			yes		12'	yes	12'	yes			
C	12'	16'	13'		yes		yes	yes					yes	yes	yes
D	12'	16'	13'	4'	yes		yes	yes					yes	yes	yes
E	12'	16'	13'	4'	yes		yes	yes					yes	yes	
F	12'	16'	13"		yes		yes	yes					yes	yes	
G	12'	12'	12'			8'						yes			
H	10'	12'	10'	6'	yes		yes	yes							
I				6'			yes		10'	yes	10'	yes			
J	10'	12'	10'	4'	yes		yes	yes					yes	yes	yes
K	8'	10'	8'	4'	yes		yes	yes							
L							yes		8'	yes	8'	yes			
M	8'	10'	8'		yes		yes	yes					yes	yes	yes

Appendix B: Budget Estimates

Assumptions:

- Budget estimates based on pricing available in **2016**
- Field size: 5 acres - 660' by 330', total linear footage of fence is 1980' with one gateway
- All materials, including posts are purchased
- Materials list does not include the initial cost of purchasing or renting stretching equipment, nor the cost of a gate
- Labor costs not included

Qty	Item	Cost each	Total
6	330' ft rolls of 8' galvanized, 20 row, fixed knot woven wire	675.00	4050.00
12	5" galvanized brace pins	0.80	9.60
12	10" galvanized brace pins	1.10	13.20
1	500 ' roll of 12 gauge galvanized wire to be used for brace points	90.00	90.00
1	50# bucket of 1.75" double barbed galvanized staples	105.00	105.00
2	Jars of 100, crimps for spicing wire	30.00	60.00
1	Jar of 100 open tabs for tying wire at brace points	35.00	35.00
	Freight on fencing components		750.00
7	13' Pressure treated corner/ brace posts – 8 – 10" diameter	34.00	238.00
12	12' Pressure treated horizontal brace posts – 6" diameter	36.00	432.00
12	12' Pressure treated brace posts – 6 – 8" diameter	28.00	336.00
90	12' Pressure treated fence posts – 4 – 6" diameter, placed every 20'	24.00	2160.00
	Freight on the posts		500.00
	<i>Total material costs to fence 5 acres</i>		\$ 8779
		<i>Cost/ Acre</i>	\$ 1756
		<i>Cost/ Foot</i>	\$ 4.43

Appendix C: Resources

Installation video : <http://www.cyclonewire.co.nz/34/instructional-videos>

Welscroft Fence Systems: <http://www.welscroft.com/>

New Hampshire Department of Agriculture and Natural Resources Conservation Service - Page 46 of the following link: <http://www.agriculture.nh.gov/publications-forms/documents/bmp-manual.pdf>

Bekaert Fencing – an excellent step by step instructional guide:

http://www.google.ca/url?url=http://fencing.bekaert.com/~media/BrandSites/Fencing/Files/Solidlock%2520Fixed%2520Knot%2520Brace%2520Specifications.pdf%3Fla%3Den&rct=j&frm=1&q=&esrc=s&sa=U&ei=KOV-VLHxJaawsAT2s4GwBg&ved=0CCAQFjAC&usg=AFQjCNGwAI-epSj9zyLJluCl-mIO_qDbkg

Gallagher Fencing: <https://am.gallagher.com/ca-en>

Deer Exclusion Fencing for Orchards and Vineyards using Woven Wire, BC Ministry of Agriculture and Fisheries: <http://www.agf.gov.bc.ca/resmgmt/publist/300Series/307251-1.pdf>

Deer Busters (plastic woven fencing): <http://www.deerbusters.com/deer-fence-poly-rolls.html>

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