



ATTTA
Atlantic Tech Transfer
Team for Apiculture

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Electric Fences in Apiaries

Importance of an electric fence in Atlantic Canada

In Atlantic Canada, there are multiple pests that threaten the safety of honey bee colonies. One major pest is bears, which will destroy equipment and eat honey, wax and bees, including brood¹. An electric fence around the apiary is the most effective way to prevent a bear attack. Remember, once an apiary is attacked, it is no longer a viable location to keep bees if that bear remains in the area. That experienced bear is unlikely to be deterred from returning even by an electric fence. One notable exception to the risk of bears in Atlantic Canada is Prince Edward Island, which does not have a bear population. In order for a beekeeper to receive compensation for hive loss due to a bear attack, the beekeeper must have taken the necessary measures to mitigate or prevent the damage (i.e. have an electric fence installed).

Key considerations for electric fencing

- For an electric fence to be effective, the fence needs to be properly installed and maintained.
- When hives are rented for pollination, the grower and the beekeeper need to determine who is to be responsible for installing and maintaining the fence. It is important to address colony protection in pollination contracts.

Maintenance and seasonality

The soil must contain sufficient moisture to conduct electricity for proper grounding. Otherwise, during drought conditions, beekeepers might need to moisten the area around the electric fencing. It is important to make sure that the grounding rod is buried deep into the soil (at least

3 feet). The grass around the fence must be mowed on a regular basis to prevent the fence from shorting out. No bare wires should touch the posts. Additionally, check the charge on the battery frequently and use a fence tester during each visit to the apiary to ensure the fence is working properly.

During the winter months the energizer and battery should be removed and stored inside a heated building. Once the bottom strand of wire is in contact with snow the function of the fence will be greatly reduced or completely ineffective. The energizer and battery can be reinstalled in early spring once the snow has melted away uncovering all the wire strands. At this point, check all fence components to ensure there is no damage and test everything works as it should.



Figure 1. A newly erected bear fence, a minimum of three strands of wire is recommended. Also note that the energizer is contained in a box within the perimeter of the fence (left top corner of fenced area).



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Baiting an electric fence

Remember that bears will not recognize the danger of an electric fence and must be trained. Fences erected in a new location need to be baited. Use bacon strips wrapped over the wire or peanut butter placed on a small strip of kitchen foil (or any other attractant) so the bear hits a charged wire while exploring the potential food source with its head or nose. The resulting shock will teach the bear to avoid the fence. Once trained to a specific fence, the bear should avoid entering that apiary and a mother bear will also teach her cubs to avoid that fence.

How does an electric fence work?

An electric fence constitutes a circuit formed between a positive and negative terminal. The energizer fence terminal (positive) links to the fence wires, while the energizer ground terminal (negative) connects to a galvanized rod firmly embedded in the ground². The energizer functions to transform battery power into a high-voltage pulse, releasing it onto a fence line approximately once per second². This pulsating release, commonly termed the “shock,” is experienced by any grounded animal coming into contact with the electrified fence². Upon contact, the circuit is completed through the animal creating an uncomfortable shock.

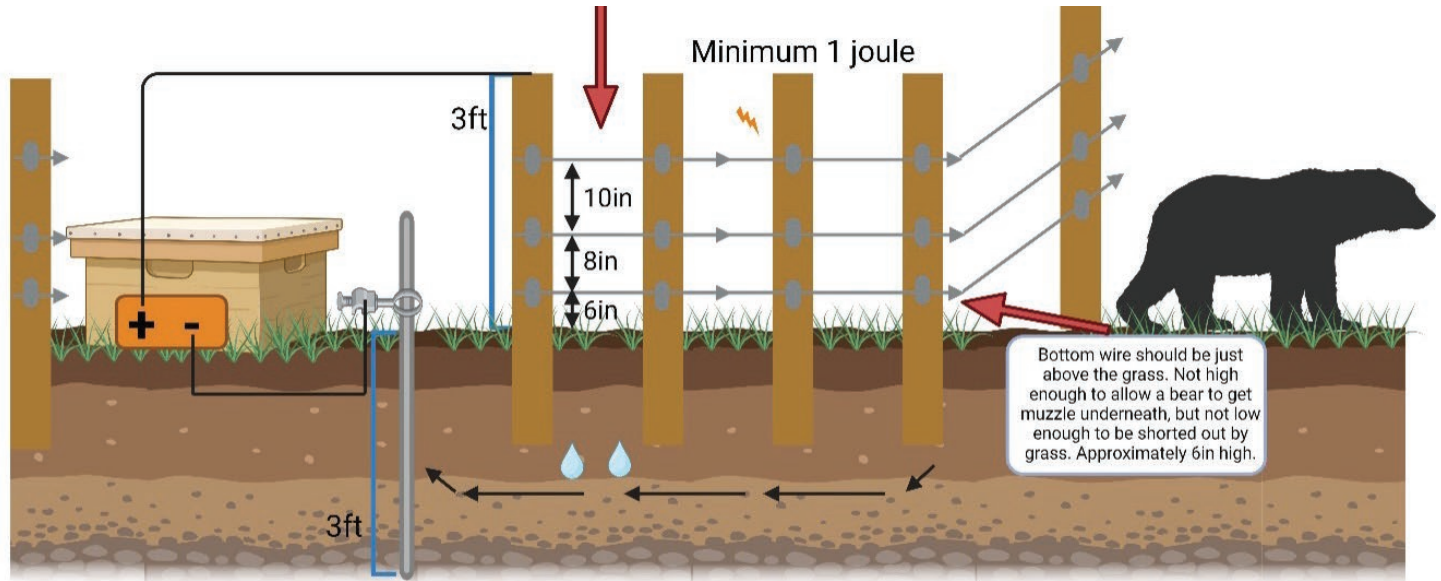


Figure 2. Schematic of how an electric fence operates (created with Biorender.com)

How to install an electric fence

Start by outlining the yard with fence posts, positioning corner posts, and spacing the fence posts evenly between them at approximately 1.5m intervals. There are various options available for fence posts, including wood, metal, and fiberglass, according to your budget and preference. Secure the fence posts and corner posts in place, ensuring there is a minimum of 1 m of fence post above the ground. Install insulators on the posts if the fence posts do not have integrated wire holders. A minimum of three strands of wire is required for a temporary fence but up to eight can be used for a permanent fence in an area of high bear pressure. For the energizer to work effectively, embed a 5-foot galvanized rod near where the energizer will be located. The rule for ground rods is the number of rods required is the number of stored joules in the energizer divided by 5. For example, if the energizer had 5 joules stored then a single 5ft grounding rod would be required. Wrap the poly wire around the corner posts to serve as a guide, then adjust the placement of the posts within the wire to create a straight line of wire along each side.

Poly wire, which consists of multi-stranded aluminum or stainless-steel wire braided within polyethylene, must be well secured to all posts. Connect the energizer to the fence using heavy wire (12.5 gauge) by attaching the positive terminal to the fence using a L-shape joint clamp and the negative terminal to the grounding rod using a grounding rod clamp. The negative terminal is important as it establishes the grounding wire by attaching the energizer to the ground rod. An option for additional grounding, if using metal posts, is to run a light gage uninsulated wire around the base of each post from the grounding rod. Connect the energizer to the battery using alligator clips, ensuring positive to positive and negative to negative.

Energizers

When selecting an energizer for an electric fence, it is essential to consider various options, most importantly the power output of the energizer. The energizer should provide a minimum of 1 joule output which is approximately 1.5 joules stored. A joule serves as a unit to gauge the energy storage capacity of an energizer and is a standard measure of energy output for electrical appliances. Joules prove to be the most effective unit of measure when evaluating and comparing different energizers. Other terminology used when discussing electric fence energizers are ampere and voltage. Ampere, also called amp, measures the amount of current passing along the fence at a given time, while voltage (number of volts) is a relative measure of the rate of electricity passing along the fence. Electric fence energizers produce low amps and high volts. Depending on the energizer, electric fences should exceed 5000 volts.

Most energizers used by beekeepers are battery powered and there are a couple of options. Integrated solar- chargers and energizer, while more expensive, require less frequent checks. On the other hand, separate energizer and battery systems are more budget-friendly, but it is essential for beekeepers or growers to ensure that the batteries are consistently fully charged. For this option, most beekeepers will use an automotive style 12-volt battery but a deep-cycle battery will outlast a standard car battery. The cost of the external deep cycle battery and the required external charger must be considered when comparing options. Opting for a 12-volt (2 joules stored or 1.4 joules output) solar-powered energizer is advisable, as it maintains a reliable charge and delivers sufficient shock to discourage bears from returning. Alternatively, D cell battery -powered (typically 0.6 joule stored and 0.42 joules output) energizer is a common choice, but it may not provide the necessary shock to deter bears, and the batteries need regular replacement. A third option is a fencer that can be plugged into a home power grid. This option is only possible if the apiary is located near a home or farm building. Energizers should be discreetly put inside an unused hive box, well covered, and placed within the fenced area out of reach of bears.

When selecting a fence energizer, choose one with low impedance so more power can be pushed through the wires. Low impedance energizers have the ability to regulate their output and maintain a constant energy supply to the fence. These energizers cope well with high weed and grass contact but will not operate efficiently if the ground is too dry. Beekeepers still need to be vigilant in ensuring grass and weeds are cut below the bottom strand of the fence. Finally, a good fence tester, measuring the voltage passing along the fence, is a helpful tool to determine the fence is working properly.

A well-constructed fence will deter bears and other predators from entering your apiary. Remember that, unless properly maintained, batteries kept charged and the fence effectively grounded, this protection will be lost.

References

1. Sammataro, D., and Avitabile, A. 2021. A beekeeper's handbook: fifth edition. Cornell University Press.
2. McKillop, I.G., Pepper, H.W., Butt, R. and Poole, D.W., 2003. Electric fence reference manual. Research and Development Surveillance Report (07. Defra, London, UK.