ELECTRIFICATION OF RIVER CROSSINGS AND WATERWAYS

Streams, rivers, dongas, dams and waterways all present a unique challenge when it comes to electric fencing. Water and electricity simply do not mix and, as all these features contain water at some time or another, these challenges have to be overcome.

Electrification offers three practical solutions to the challenge of barricading waterways:

1. Electrified Flood Gates
2. Electrified Floating Fences
3. Electrified Sacrificial Fences

1. ELECTRIFIED FLOOD GATES

The advantages of electrified flood gates are:

- They will prevent animals from breaking out via the river bed at low water levels.
- They allow debris to pass under or through them.
- They can be built to almost any size and length.
- The length of the hanging chains can be adjusted easily.
- A flood gate controller will prevent power loss when the water level rises.
- A large flood gate can justify the use of its own energizer thereby not jeopardizing the integrity of the whole electric fence.

a. Small Flood Gates

These are ideal for barricading small streams and/or dongas (eroded waterways).

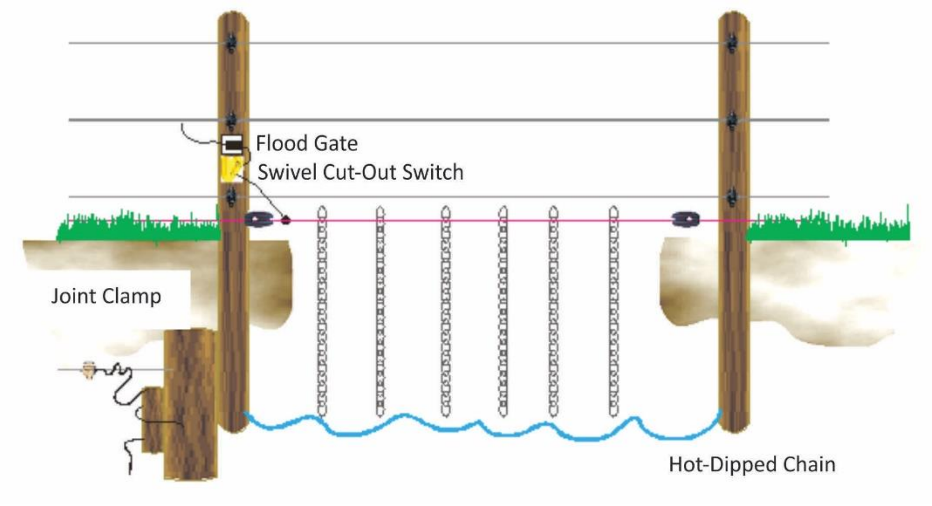

Fig 1. *Diagram of a Small Flood Gate*

Where the electric fence crosses a stream or donga, a wire or thin cable, insulated from the posts at either end, is strung across the waterway. Chains are then attached to this wire and they are set to hang just above the normal water level surface creating a *flood gate*. The fence is then connected to this *Flood Gate* via a *Food Gate Controller* which will limit the power to the *Flood Gate* should it make contact with the water when the river rises. This structure is an effective electrical barrier, and a curtain through which flood waters can pass.

In the event of a flash flood, when the chains are engulfed in water, these chains will lift or part and so will let any debris that is being washed down the stream, pass through the gate while not affecting the electric current flow on the fence line. In the event of the stream level rising slowly, the chain lengths can be adjusted by using small wire S-hooks. Simply hook the chains up a few links to keep them above the water level.

It is advisable to incorporate a *Cut-Out Switch* into the design. Firstly, this will enable one to hook the S-hooks onto the chain without being shocked and secondly, if it is anticipated that the water level is going to remain high for a period of time, one can isolate the *Flood Gate* from the general fence circuit. (There may be a small loss of power through the *Flood Gate* and if there are a number of crossings in the fence line, it needs to be understood that, naturally this will reduce the overall effectiveness of the fence.)

b. Large Flood Gates

Barricading a wide river crossing can be very challenging, especially when the river's flow can change, at times, very rapidly from a mere trickle to a raging torrent. The Natal Parks Board, back in the 80's, faced this challenge across the Umfolozi River, and this is how they tackled the challenge.

The first problem they encountered with their very long flood gate, was simply that of its weight and the sag this caused. (Unless a river's banks, on either side of the site of the flood gate, are high enough, the center section may have insufficient height to clear the water.) They overcame this sagging problem by attaching a Bonnox type mesh to the underside of the cable supporting the chains. This gave the cable greater rigidity and reduced the sag.

The next problem that they encountered was one of poor conductivity. The poor connections at each of the hundreds of chain links making up the chain curtain, reduced the power reaching the ends of the chain drops. This problem was overcome by reducing the length of the chains by substituting the portion attached to the Bonnox with 6mm round bar and welding shorter lengths of chain to the bottom of the bar. In this way they improved conductivity but were still able to adjust the length of the chains with S-hooks.

They also further reduced the weight problem by reducing the width of the actual flood gate portion, so that it covered only the width that the water reached during normal flooding. Then they installed sections of *sacrificial fencing* between the area covered by the flood gate and the riverside edge of the game fences on either side. These sections could be replaced, if damaged, during exceptional flooding.

The problem of earthing on dry river sand which is a poor conductor, was overcome by laying chicken mesh on the ground at the base of the flood gate chains and sacrificial fences. This creates an earth grid which improves conductivity and so completes the circuit when an animal steps on it.

The final challenge encountered was wind that cause the curtain to swing and the chains to become entangled. This was overcome by threading light fishing line through the links in the chain of the curtain. This line would break in the event of a flood and so would not hamper the chains from parting and letting debris through.

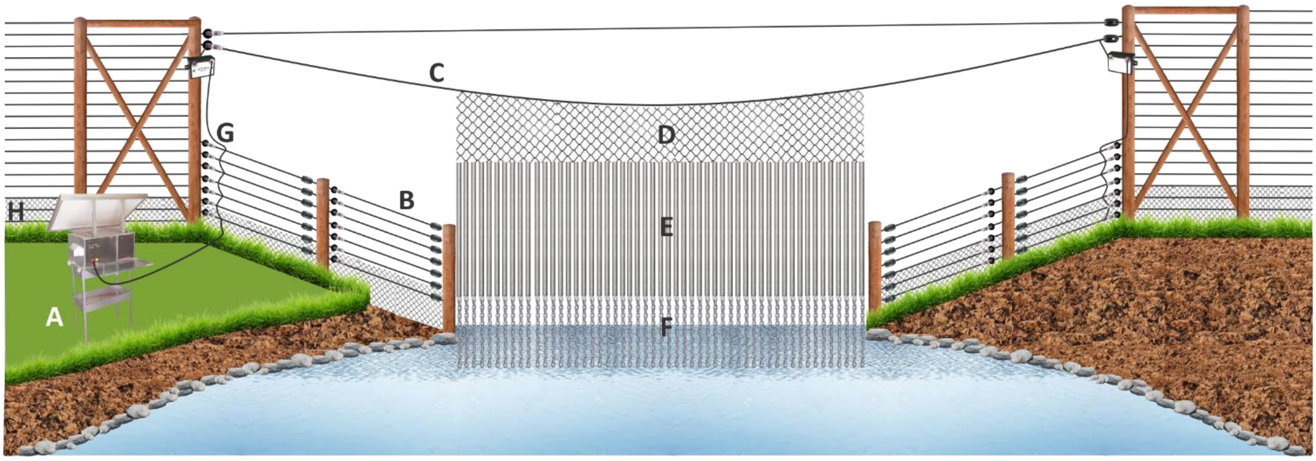

Fig 2. *Diagram of a Large Flood Gate*

A Game Shock Box
B Sacrificial Fences
C 10mm support cable
D 2,5mm galvanized support mesh
E 6mm galvanized round bar
F 3.5mm galvanized chain
G Double insulated under-gate cable
H Galvanized chicken mesh

Method

Power is fed into the support cable **C**, via a flood-gate controller, from an energizer housed in a Shock Box.
The sacrificial fences **B** are linked, via Flood Gate Controllers, using lengths of under-gate cable **G** from the game fences **A**, on either side.

Power is fed into the chains **F**, via the weldmesh **D** and the round bar **E.** In the event of the water rising slowly, the chains can be shortened using wire S-hooks, but if the chains are rapidly immersed, the sacrificial fences on either side will retain power until, in the event of an exceptional flood, they may be washed away. Earthing along the sandy banks and river bed was improved by pegging galvanized chicken mesh to the ground.

2. FLOATING FENCES

A floating fence can be installed where water levels rise and drop slowly. The diagram below illustrates the floating fence installed across the Kafue River in Zambia. Here, when the flood gates of a dam higher up the river were opened, the river would slowly rise and with the rise of the water the fence would rise on its floats.

Variations of this type of construction have also been successfully employed where fence lines end at dams which are subject to fluctuating water levels during droughts.

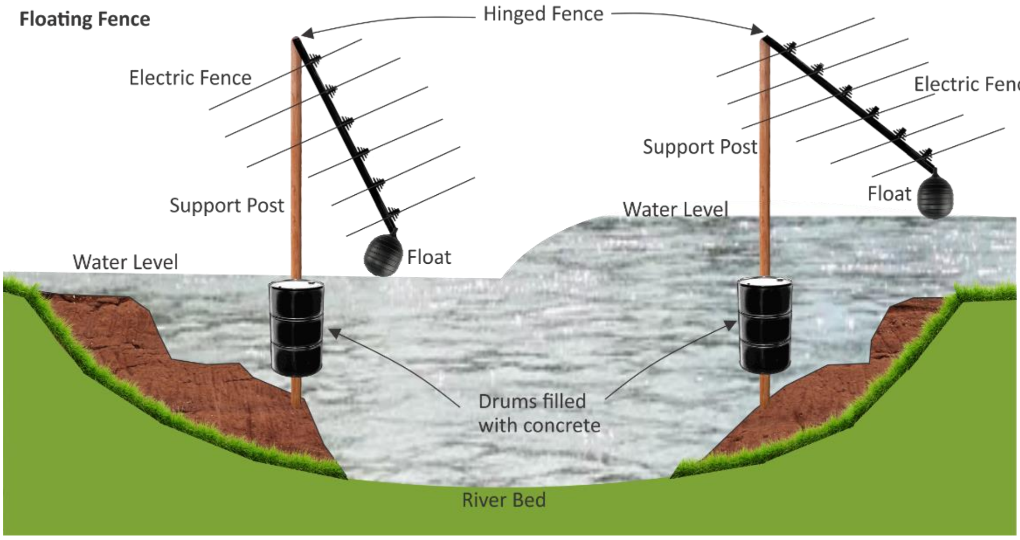

Fig 3. *Diagram of a Floating Fence*

A Floating Electric Fence across the Kafue River in Zambia

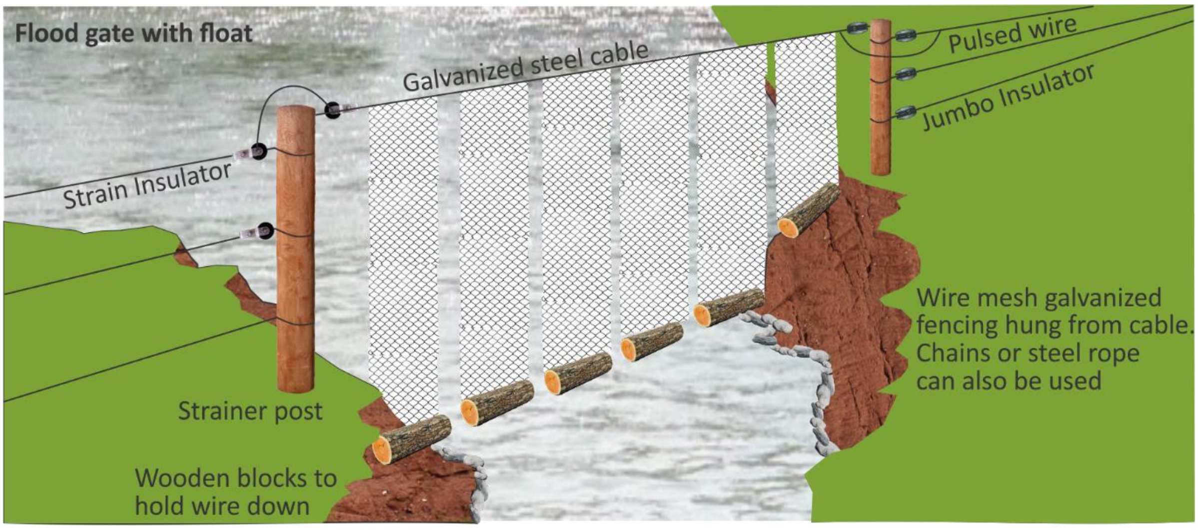

Fig 4. *Diagram showing a Flood Gate with Floats*

3. SACRIFICIAL FENCES

Sometimes it is easier to strain the electric fence wires straight across the top of a dry donga and then to build a small sacrificial fence at the bottom which can wash away in a flash flood and be replaced easily.

Sacrificial fences should be very well anchored on one side so as not to wash away completely. After the flash flood the damaged fence can usually be resurrected from the salvaged materials. Use braided galvanized wire which is bio-degradable and not nylon Poliwire or Politapes because, if washed totally away, these synthetic fibers can cause problems should they be ingested by an animal.

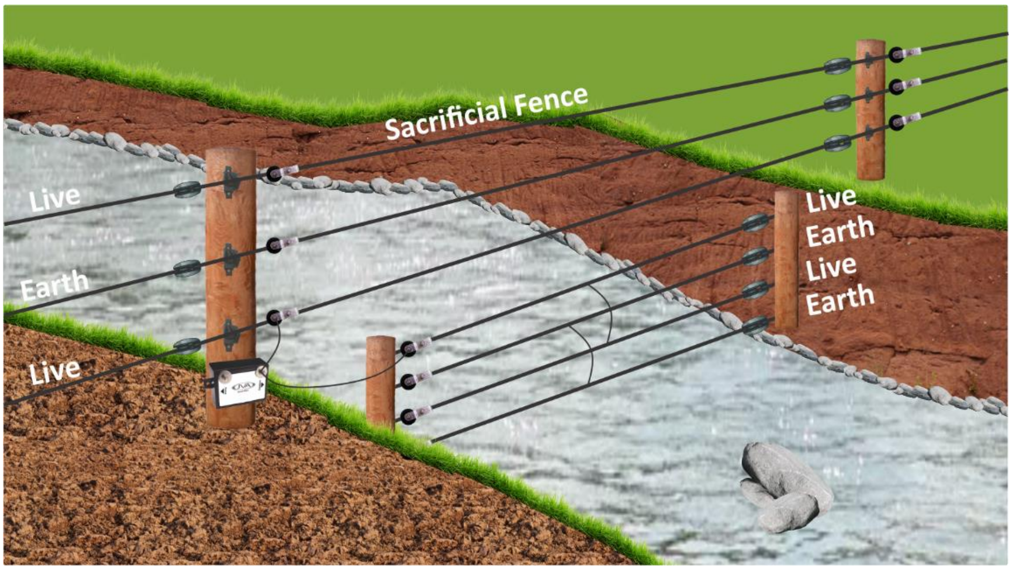

Fig 5. *Diagram showing a Sacrificial Fence*

A Sacrificial Electric Fence across the Umfolozi River

Note: If an electric fence does not span the entire river crossing above a flood gate or sacrificial fence, do not rely on the floodgate or sacrificial structure to form an integral part of the total electric fence circuit. If interrupted, the two ends of the electric fence must be connected together using under-gate cabling and the flood gate or sacrificial fence must be an independent entity, fed from the fence via a flood gate controller.

There are many variations on these designs. However, it is hoped that these basic ideas will be of assistance.