



Flap Gate Fish Passage

A flap gate is a flow control device that, in principle, functions as a check valve, allowing water to flow through it in only one direction. The flap gate usually consists of a flat plate that is hinged at the top of a culvert outfall. The plate falls into a near vertical position over the face of the culvert opening to close it. A positive head differential against the downstream face (water elevation higher on the downstream side) will force the flap against the face of the culvert to seal it. A positive head against the upstream face of the gate (water elevation higher on the upstream side) will force it to open to release water.



Figure 1. 36" Flap gate on Coastal North Carolina drainage canal.
Photo by Doug Newcomb/FWS

Typically, flap gates are made of cast iron, plastic, fiberglass, and aluminum. Larger gates are built of wood and are often hinged at the sides rather than the top.

Attaching flap gates to culverts that are placed through tidal dikes or river flood dikes is common. The flap gates allow a stream to drain normally during normal flows but prevent high tides or river floods from backing water up the stream channel.



Figure 2. Water control structure with metal and wooden flap gates.



Fish Passage



Figure 3. Herring dipping at Lake Landing outfall canal. April 1969

When closed, flap gates are obviously a barrier to all fish migration. Unless specifically designed for fish passage, most are also a barrier to fish migration when they are open.

Flap gates can be a barrier due to the head differential across the gate, or by the narrow opening available for passage when the gate is open. It may also be a barrier, like any other culvert, if the downstream end is perched above the water surface.

There are several solutions to fish passage barriers through flap gates. A method used in Canada is to modify the gate mounting hardware, so the gate is rotated about 90 degrees and it is hinged on the side. The hardware must be modified to structurally support the gate, to keep it from opening too far, and to provide a thrust bearing for the weight of the gate. The gate should be mounted at an angle less than 90 degrees. If the gate is rotated a full 90 degrees, the weight of the gate will not help close it.

A second method is to use a lightweight gate such as plastic or aluminum. These lighter weight materials are formed into a thin dome - shaped gate. These considerably lighter gates open much wider with less head differential (water surface elevation difference). These flap gates also have greater outflow capacity.

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