

BARRIERS TO RESTRICT MOVEMENT OF GRASS CARP FOR MANAGEMENT OF AQUATIC WEEDS, University of Florida Institute of Food and Agricultural Sciences, December 1985

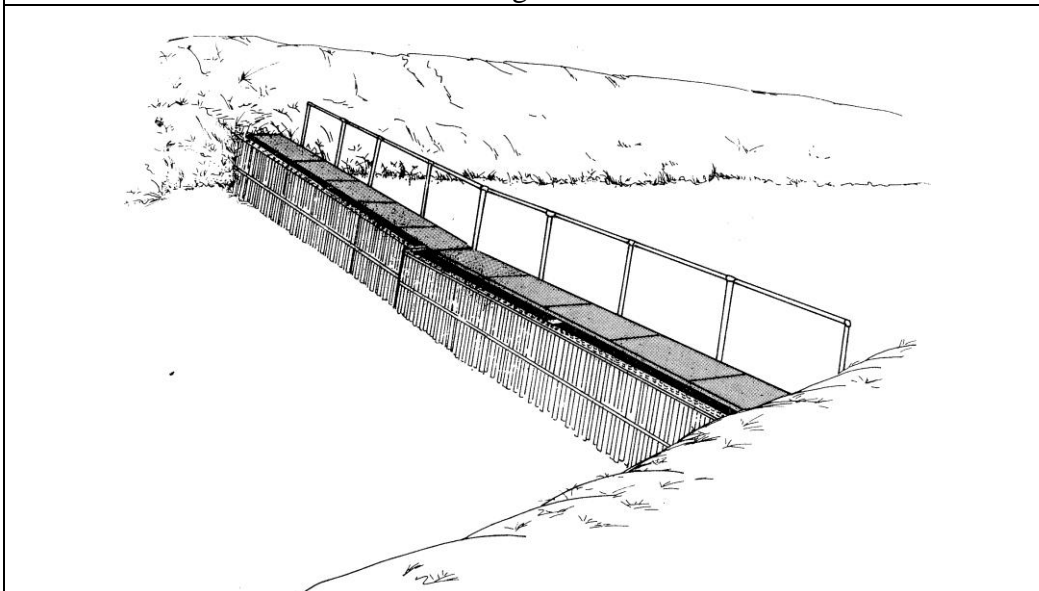
INTRODUCTION: Herbivorous fish are effective for the biological control of aquatic weeds. Grass carp (*Ctenopharyngodon idella* Val.) can be used successfully for aquatic weed control in Florida. The Florida Game and Fresh Water Fish Commission is now issuing permits for the use of triploid grass carp for the biological control of aquatic weeds in Florida. No one is allowed to transport into the state, introduce, or possess any grass carp until a permit has been received from the Florida Game and Fresh Water Fish Commission. Triploid grass carp are those fish which have been certified as having 3 chromosome sets in their cells. Normal grass carp have 2 chromosome sets. The grass carp are purposefully produced as triploids so they will be sterile when mature.

FISH CONTAINMENT: When stocking triploid grass carp (hereafter referred to as "grass carp") to control aquatic weeds, it is important to select the proper stocking rate of fish for the specific conditions in the treatment area. It is necessary to ensure that these fish will remain in the treatment area for weed control. If there are canals, ditches, culverts, streams, or any other type of flow into or from the water body where the fish will be stocked, steps must be taken to restrict movement of the fish. One way to contain the grass carp is to place a rigid barrier across the open channel that will not allow them to pass, yet will not significantly restrict water flow.

PURPOSE OF FISH BARRIER: The fish barriers described in this publication were designed to: (1) contain the grass carp; (2) have openings large enough to allow floating materials, suspended detritus, and weed fragments to pass through the barrier during periods of water flow, yet small enough to prevent passage of the grass carp; and (3) permit easy removal of vegetation and debris from the front of the barrier by an individual using a hand tool such as a rake.

BARRIER DESCRIPTION: A free-standing barrier consisting of vertical bars, shown in Figure 1, can be placed across a ditch, canal, or from shore to shore across any body of water at a location where it is desired to restrict the movement of the grass carp. The walkway allows easy access to the full width of the barrier for cleaning of debris which may collect against the vertical bars. The walkway also provides support for the vertical bars.

Figure 1. Full view of a cross-waterway barrier which can be used to restrict fish movement at a site with no existing structure.



Barriers can also be mounted on suitable, existing structures, such as the ones shown in Figures 2 and 3, which are attached to the risers of a flashboard structure.

The vertical restraining bars have been constructed from different materials. One such material used was 18-8 stainless steel conduit, 7/8 inch (2.2 cm) in diameter, set in two rows on 2-inch (5.1 cm) staggered centers, creating a 1-1/8 inch (2.9 cm) gap. A view of this bar spacing is shown in Figure 4a. The stainless steel conduit was used because of its availability; however, galvanized or black iron pipe 1/2 inch (1.3 cm) in diameter, galvanized conduit, solid rod 3/4 to 1 inch (1.9 to 2.5 cm) in diameter, or 1/2 inch (1.3 cm) schedule 40 PVC pipe would have been equally suitable. We now suggest the use of schedule 40 PVC pipe because of its resistance to corrosion, and the characteristic of allowing debris to pass more easily through the barrier.

The conduit was located by holes in horizontal 4 x 1-5/8 inch (10 x 4.1 cm), 5.4 pounds per foot (2.4 kg per 0.30 m), channel at the top of the barrier, with other supporting channel spaced at approximately 3 foot (0.91 m) intervals. The channels were installed with the flange down and the web up, and attached to the walkway or drop structure track. Side channels, welded to the front channel to form a continuous structure, supported the barrier's vertical bars 12 to 16 inches (30 to 41 cm) in front of the walkway or flashboard structure. The side channels also supported and located vertical rods in the same pattern as the front channels. To construct the bottom of the vertical bar structure, install a section of horizontal channel, similar to Page 2 of 3 the top channel, and allow the vertical bars to extend down through to the lower channel. The flashboard riser frame should seal all areas completely. The frame should include a bottom that serves as an extension of the flashboard riser bottom. This gives a rigid, secure barrier around all sides of the structure.

As the width of the barrier increases, the horizontal channel and other material used to support the vertical bars should be of a heavier gauge to withstand pressures exerted from a head of water should debris block the barrier.

The walkways and tops of the drop structures were covered with expanded steel on the side toward the containment to prevent fish from jumping over the tops of the barriers.

Figure 2. Barrier constructed using a double row of vertical bars mounted on a flashboard riser water control structure.

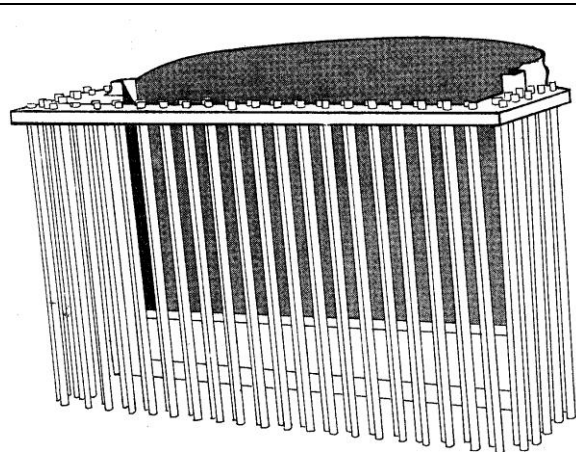
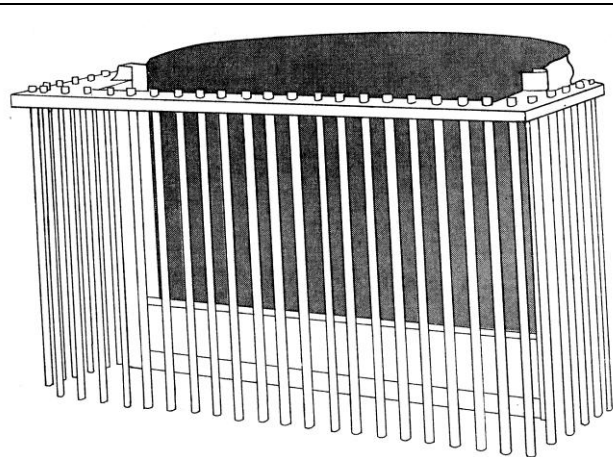


Figure 3. Barrier constructed using a single row of vertical bars mounted on a flashboard riser water control structure.



Other barriers have had vertical bars which were 1/2 inch (1.3 cm) schedule 40 PVC pipe in a single plane on 2-inch (5.1 cm) centers. The welded frames which held the pipes had a 2 x 1-inch (5.1 x 2.5 cm) channel sill and side verticals and either flat bar or channel cross bars on 18 to 24-inch (45 to 61 cm) spacings. The sills were set 6 to 8 inches (15 to 20 cm) below the bottom of the drop structure with the flanges up to restrain the pipes laterally. Siltation around the bottoms of the pipes also helped lateral restraint. The pipes were secured downward by a cotter pin below the upper cross bar and could, be removed for cleaning or replacement. The sides of the frame, which projected approximately 12 inches (30 cm) in front of the drop structures, were covered with 16 gauge, 1 x 2-inch (2.5 x 5.1 cm) or 1-1/2 x 3-inch (3.8 x 7.6 cm) mesh expanded steel.

Figure 4a. Top view of channel used in the barrier with double row of vertical bars, showing the spacing of the vertical bars.

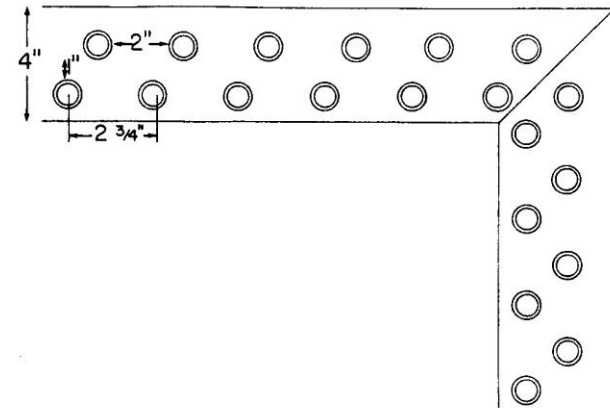
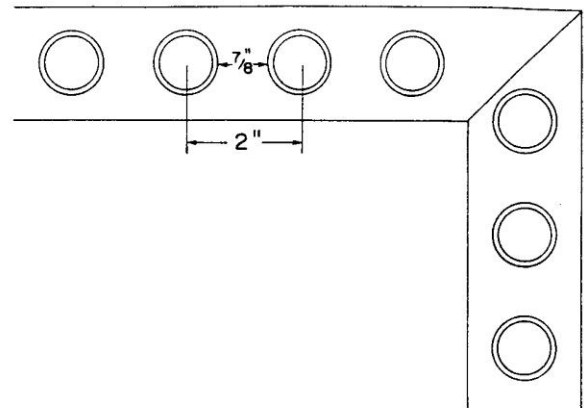


Figure 4b. Top view of channel used in the barrier with a single row of vertical bars, showing the spacing of the vertical bars.



ROUND CULVERT BARRIERS: To place a barrier on corrugated steel culvert, the vertical bars were supported in a square frame. This frame was welded to a steel band for mounting on the culvert. The steel band was then placed over the culvert so that it encircled the end of the culvert. The steel band should be bolted or firmly attached in some way to secure the frame with the vertical bars flush against the opening of the culvert. This will prevent movement of the grass carp through the culvert.

SUMMARY - RECOMMENDED BARRIER DESIGN: The barrier design that best fulfills the requirements is a steel frame supporting a single row of vertical bars of PVC pipe. The use of PVC pipe eliminates the problems caused by corrosion of steel vertical bars. As the steel corrodes, there is a greater tendency for debris to catch in the barrier, and maintenance time increases. This design will contain effectively the grass carp, while permitting relatively easy cleaning of debris from the vertical bars. The barriers should be mounted on the upstream side of the culverts so the floating debris will not collect inside the culverts. The steel in the construction should have a suitable coating to prevent oxidation (rusting) and corrosion. The spacing of the vertical bars should be set as wide as possible to pass the maximum amount of debris, yet not large enough to permit movement of the grass carp being stocked. The 1/2 inch (1.3 cm) schedule 40 PVC pipe in a single row on 2-inch (5.1 cm) centers should contain most all grass now being sold for stocking.

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