



US Army Corps
of Engineers
Chicago District

Operational Protocols for Electric Barriers Fact Sheet

Overview:

Bighead carp (*Hypophthalmichthys nobilis*) and silver carp (*Hypophthalmichthys molitrix*) are nuisance invaders of the Mississippi River Basin and a potential threat to the Great Lakes. Electric dispersal barriers constructed and operated by the US Army Corps of Engineers are employed in the Chicago Sanitary and Ship Canal (CSSC) to deter the migration of aquatic nuisance species, especially Asian carp, through the waterway.

The Corps has undertaken numerous research efforts in support of a Congressionally authorized "Efficacy Study" to determine and refine the optimal operating parameters of the electric barriers. These studies have been conducted through a collaborative effort between the Corps' Engineer Research & Development Center (ERDC) and the Corps' barrier contractor, Smith-Root, Inc. (SRI). An "Operational Protocols Report" on these efforts was recently finalized. The report reviews laboratory research efforts related to the impact on small Asian carp of various stimuli expected to be found near the Electrical Dispersal Barrier system in the CSSC. The research included five different laboratory experiments focused on the electrical parameters, water conductivity, small fish volitional challenge of electric fields, and water velocity. The experiments were conducted in a controlled environment in the research laboratories at ERDC.



Swim Tunnel Test

Most of the experiments discussed in the Operational Protocols Report focus on defining the electric barrier operating parameters necessary to deter the movement of very small Asian carp, about two to three inches long, spawned that year. Longer fish are more readily deterred than shorter fish, because the longer the fish, the greater the electrical gradient that develops across it. As a result of the inverse relationship between fish size and electric field effectiveness, research on optimal operating parameters was focused on shorter fish, with confidence

that operating parameters that deter shorter fish will also be effective on longer fish.

Barrier Operations:

Barrier operating parameters are based on the combination of three factors: field strength (voltage), pulse length (duration of electrical pulse), and frequency (Hertz). Current barrier operating parameters are set at 2 volts per inch field strength, 6.5 millisecond pulse length and 15 hertz frequency. These settings were established based on a previous study of operating parameters completed in 2009, conducted with juvenile silver carp measuring 5.4 to 11 inches.

New Report:

The laboratory experiments in this latest series of test were conducted on very small, 2 to 3 inch bighead carp. In the experiments on effects of electrical parameters, water conductivity, and water velocity, fish were subjected to electrical exposures in a fashion that mimicked exposure that would be received by fish penetrating the electric field of Barrier IIA in the CSSC. The primary outcomes of interest included the degree to which encroaching fish were immobilized (i.e., rendered incapable of swimming motions) and exhibited avoidance behaviors. The results of the experiments suggest that not all very small Asian carp may be immobilized by the current operating parameters. The report identified potential changes to all three operating parameters that would be effective at immobilizing the smallest fish. Based on extensive field research by USFWS and USGS, very small Asian carp are not located near the barriers at this time. The Corps will continue to coordinate with the USFWS and evaluate any new data on the location of very small Asian carp, while it continues its efforts to determine how higher operating protocols could be safely administered, as part of its decision-making related to optimal operating parameters.

What's Next? Efficacy Study Interim II Report:

The results of this research will inform the Efficacy Study's Interim II Report, which will evaluate all of the information on optimal operating parameters on the impact to very small fish, potential safety impacts of altering the parameters, and information on the location of 2 to 3 inch Asian carp. This will allow the Corps to make a well-informed coherent decision about the manner in which the barriers should be operated. It is undesirable to operate the barriers at higher operating parameters than necessary because of potentially increased safety risks and increased wear and tear on the Electric Dispersal Barrier equipment resulting in more frequent maintenance needs. The Corps intends to publish the Interim II Report later in 2011, and will continue to evaluate and refine the operation of the electric barriers to ensure their efficacy.