



Midwest Floodwaters Provide Habitat for Grass Carp To Spawn

The unprecedented flooding in the Midwest caused billions of dollars in damages to the economy. Fish and wildlife were affected by displacement and by alterations in their habitats. Although fish and wildlife might be killed and their habitats destroyed, floods create new habitats and return other habitats to an earlier successional stage. Most species are temporarily harmed, but some will benefit in the long run. The flood has expanded habitat for one non-native species, the grass carp (*Ctenopharyngodon idella*), which will likely spread into new areas.

High Water Triggers Grass Carp Spawning

High water with increased current and turbidity elicits grass carp migration to spawning sites and stimulates mating behavior. Spawning habitat exists only in large rivers, and spawning requires temperatures above 18°C. Only summer floods provide the combination of warm temperatures and high waters ideal for spawning. In previous years, spawning in the United States occurred only in the lower Missouri and Mississippi rivers and a river in Texas. With flooding, many more waterways are transformed into large rivers and provide spawning habitat. Grass carp now present in the Mississippi system should have had ample opportunity to spawn in a number of tributaries.

Conditions Are Ideal for Egg Incubation

Grass carp eggs are semipelagic and require currents to keep the eggs suspended for a 20- to 30-h incubation period. Current speed must be 0.6 to 1.5 m/s. The duration of incubation depends on temperature—faster hatching occurs at temperatures above 25°C. The river length needed for incubation depends on the combination of current speed and temperature. At typical flood conditions in the Midwest, 50 to 80 km of free-flowing water is needed. Eggs tolerate high turbidity.

Floods Opened Way to Nursery Habitat

Lack of access to backwater nursery habitat limited grass carp in the Mississippi system in normal years because rivers were confined to their main channels. After hatching, larval grass carp must find their way out of the river channel into backwaters. With levees bursting and river water spilling into the floodplains, the larvae are transported into habitat well-suited for survival and growth. The flood of 1993 created millions of hectares of nursery, fulfilling the habitat requirement of submerged terrestrial vegetation. Planktonic food, such as rotifers, should multiply rapidly, whereas fish predators of grass carp larvae

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should be relatively scarce because they reproduce too slowly to take advantage of the new waters. Growth and survival of the early life stages of grass carp should be excellent.

As waters recede, the juvenile grass carp will seek deeper waters. Grass carp prefer water deeper than 1 m and this would lead to their escape from bottomland fields before pools become isolated. Some young, however, might become trapped in isolated pools and perish. Even these might survive if rains continue.

Floods May Produce Strong Year Class

The Midwest floods are likely to produce a strong year class of grass carp in 1993. Floods during the warmer months and the extensive backwaters have provided an ideal situation for populations of grass carp. Because grass carp quickly grow to sizes not eaten by predators, the strong year class should persist for years. Because the normal life span of grass carp is more than 10 years, the 1993 year class is likely to be dominant for the next decade. If their proliferation causes environmental damage, the damage will be long lasting.

The present abundance of grass carp in the Mississippi system is not known. Grass carp have not caused noticeable ecological damage (that is, destruction of desirable aquatic vegetation). With an unknown base population, it is difficult to predict what effect a strong year class will have on the environment. If another 500-year flood occurs after this year class reaches sexual maturity in 2 to 3 years, then grass carp might become extremely abundant. What is the probability of a second

500-year flood in, say, 8 years? Slightly more than one chance in a hundred.

Managers Can Plan Ahead

Managers of flooded wildlife refuges in the Mississippi system have many problems without worrying about a new exotic species. Grass carp within their waters after the flood recedes, however, must be dealt with. Because grass carp feed on the same species of aquatic vegetation used by waterfowl, managers might check for the presence of grass carp and attempt removal once levees are restored and physical damage is fixed. A fish removal item might be put into budgets in anticipation of disaster funds becoming available.

Exotic species do not often become abundant immediately after escape. They might barely persist until presented with a natural event that favors their life history strategies. One can only hope that the grass carp does not take advantage of the 1993 floods to greatly expand its population so that it becomes a nuisance species to fish and wildlife like its cousin, the common carp (*Cyprinus carpio*).

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