



## Aquatic Invasive Species (AIS) Control Plan: Invasive Carp

This control plan is a living document that will be updated, as needed, to reflect the status of the species in Pennsylvania.

### Natural History

Description: The term “Invasive Carp” usually refers to four species: Bighead Carp, Silver Carp, Black Carp, and Grass Carp. (Note that this species group was typically referred to as “Asian Carp” prior to 2021 when the name “Invasive Carp” was established by various U.S. agencies and organizations). In Pennsylvania, Bighead Carp, Silver Carp, Black Carp, and Diploid Grass Carp (hereafter “Grass Carp”) are of concern as aquatic invasive species. Triploid Grass Carp are a sterile genetic variant of Grass Carp which may be stocked in certain Pennsylvania waters for aquatic vegetation control only under special permit.

### Taxonomy

Common name: **Bighead Carp**  
Family: **Cyprinidae**  
Species: *Hypophthalmichthys nobilis*  
Integrated Taxonomic Information System (ITIS) Serial Number: **163692**

Common name: **Silver Carp**  
Family: **Cyprinidae**  
Species: *Hypophthalmichthys molitrix*

ITIS Serial Number: **163691**

Common name: **Black Carp**  
Family: **Cyprinidae**  
Species: *Mylopharyngodon piceus*  
ITIS Serial Number: **639618**

Common name: **(Diploid) Grass Carp**  
Family: **Cyprinidae**  
Species: *Ctenopharyngodon idella*  
ITIS Serial Number: **163537**



**Figure 1.** (Top) Bighead Carp (Source: KY Dept. of Fish and Wildlife); (2<sup>nd</sup> From Top) Silver Carp (Source: USGS); (2<sup>nd</sup> From Bottom) Black Carp (Source: USGS); (Bottom) Grass Carp (Source: USFWS).



Morphology:

Bighead Carp (Figure 1, Top) are laterally compressed with the top being a dark gray color which grades down to off white on its belly. Bighead Carp have many dark blotches on its sides. The head is comparatively large with no scales and a large terminal mouth. This species has no teeth and its lower jaw protrudes out farther than its upper jaw. The eyes are situated low on the head and are positioned downward. Bighead Carp have a keeled belly from the pelvic fins to the anal fin. This species reaches a maximum size of approximately 110 pounds.

Silver Carp (Figure 1, 2<sup>nd</sup> From Top) are deep-bodied fish which are laterally compressed. Younger fish are silver in color, with older adults having green shades on the dorsum and a silver venter. Silver Carp have a sharply keeled belly from the anal fin to the throat. Maximum size is approximately 60 pounds.

Black Carp (Figure 1, 2<sup>nd</sup> From Bottom) are blackish-brown fish with blackish-grey fins which contain an elongated and laterally compressed body. This species may grow over 3 feet in length and weigh over 100 pounds.

Grass Carp (Figure 1, Bottom) are morphologically similar to Black Carp, containing an elongated and laterally compressed body. Grass Carp are typically olive-brown dorsally, with silver on the

sides and a white venter. Maximum size is close to 100 pounds.

All four species have pharyngeal teeth which are morphologically unique to each species.

Origin: Invasive Carp species are native to Eurasia and China. They were imported into the southern United States primarily during the 1960s through the 1980s.

Food Preferences: Both Bighead Carp and Silver Carp are primarily filter feeding planktivores. Introduced Bighead Carp have recently been demonstrated to have a varied diet consisting of phytoplankton, ichthyoplankton, zooplankton, small invertebrates, detritus, and excrement from filter-feeding mollusks. Black Carp feed primarily on shelled or hard-bodied invertebrates (e.g., mollusks, crustaceans and insects), but also will consume zooplankton and detritus. Grass Carp primarily consume aquatic vegetation but may also feed on invertebrates such as aquatic insects.

Reproductive behavior: Bighead Carp and Silver Carp are known to spawn multiple times per year. Their eggs require moving water to keep them suspended during development. Black Carp eggs are released only once per year and drift until they settle in calm waters. Bighead Carp and Silver Carp prefer water temperatures around 25°C for spawning. Black Carp spawning occurs at about 26-30°C. Grass Carp typically spawn at water temperatures of 20-30°C.



Notable Behavioral Characteristics: Silver Carp are noted for launching themselves high out of the water when disturbed by boats, skiers, electroshocking, etc.

Historic Vectors: Invasive Carp species were imported under various private and governmental programs for control of pests in aquaculture facilities in the southern United States. Flooding in the late 20<sup>th</sup> century allowed escape of Invasive Carp species into the Mississippi River system.

Current Pathways/Vectors: Black Carp have shown limited dispersal since their escape compared to other Invasive Carp species; however, dispersal appears to have accelerated in recent years. Bighead Carp and Silver Carp have dispersed rapidly northward in the major river systems of central North America. Grass Carp have become widespread in many portions of North America due to escapes and historic stocking for control of aquatic vegetation. There have been sporadic reports of isolated, disconnected occurrences of all Invasive Carp species that may be anthropogenic in origin. Release of these species by humans is a potential secondary pathway. This is particularly true near cities since these fish are sometimes illegally sold in food markets, or areas with pay lakes in which these species may be illicitly stocked.

Preferred Habitat: In the upper Mississippi River and lower Illinois River, depending on river flow, both Bighead Carp and Silver Carp preferred unstructured main channel

borders and also show a preference for contiguous backwater open habitats and island side channels. In an Illinois River study, both species rarely were found in water > 4m in depth. Peak dispersal occurs with rising water levels. At least for brief periods, Bighead Carp can tolerate salinities of 6-12 ‰ and temperatures to 38°C with an optimal maximum around 26°C. Little is known of Black Carp habitat preferences in this hemisphere. Grass Carp prefer still or slow-moving waters, such as lakes, ponds, or river backwaters, and are tolerant of low salinities.

## **Distribution and Status**

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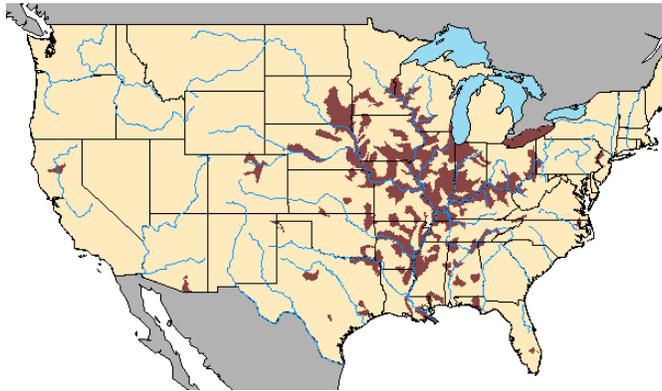
Distribution: Bighead and Silver Carp have spread throughout the major river systems of the central United States (Figures 2 and 3) while Black Carp are more limited in their distribution within the Mississippi basin (Figure 4). The nearest record of Black Carp to Pennsylvania is a disjunct and isolated record occurring in a private pond in West Virginia (Figure 4). The nearest records of Silver Carp to Pennsylvania occur in southern Ohio (Figure 3).

Bighead Carp were detected in one pay lake in southwestern Pennsylvania in 2014. These fish were removed and do not appear to have spread elsewhere. The closest known capture of Bighead Carp to Pennsylvania is in the Ohio River at the New Cumberland Pool, approximately 13 river miles downstream of the Pennsylvania border.

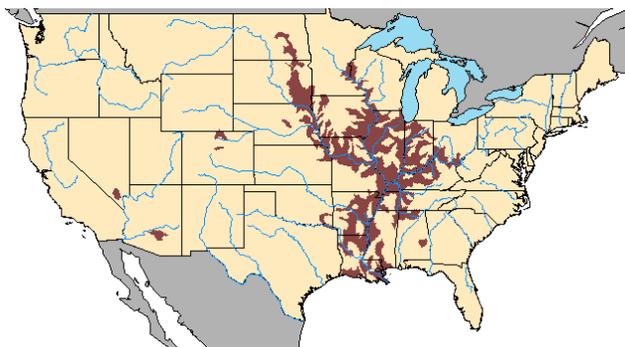


However, recent environmental DNA (eDNA) results may suggest that both Bighead Carp and Silver Carp have crossed the Pennsylvania border of the Ohio River.

Grass Carp have the most widespread distribution within North America of all Invasive Carp species (Figure 5), likely due to escapes from historic stockings of this species to control aquatic vegetation. Within Pennsylvania, Grass Carp have been collected in portions of the Ohio, Delaware, and Susquehanna Rivers.



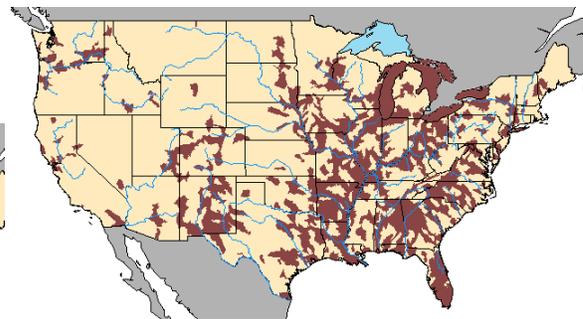
**Figure 2.** Distribution of Bighead Carp in the United States. Source: USGS.



**Figure 3.** Distribution of Silver Carp in the United States. Source: USGS.



**Figure 4.** Distribution of Black Carp in the United States. Source: USGS.



**Figure 5.** Distribution of Grass Carp in the United States. Source: USGS.

Pennsylvania Legal Status: It is illegal to possess, transport, or introduce Bighead Carp, Silver Carp, Black Carp, or Diploid Grass Carp in Pennsylvania. Triploid Grass Carp, a sterile genetic variant of Grass Carp, may be imported and stocked in certain Pennsylvania waters by permit only. All four species are currently regulated in PA Code Title 58 § 71.6 and § 73.1.

## Threats

Bighead Carp and Silver Carp have the potential to radically alter aquatic ecosystems. As highly fecund and voracious filter-feeders that can ultimately constitute upwards of 90% of the biomass in infested



areas, both species are capable of wiping out the base of the local food web, thus depriving native fish and mussel species of sustenance. Therefore, these species pose a major ecological and economic threat to Pennsylvania's established fisheries. The propensity for Silver Carp to leap from the water when disturbed has been the cause of several severe injuries to people who have been struck by the fish while skiing, jet skiing, and boating.

Black Carp, capable of consuming large quantities of mollusks, pose a specific threat to Pennsylvania's imperiled freshwater mussel fauna, particularly towards federally or state-listed mussel species or those identified as species of greatest conservation need.

Grass Carp may disrupt aquatic food webs due to their strong feeding pressure on aquatic macrophytes. However, the broader effects of Grass Carp on ecosystems, despite years of study, are thought to be complex and influenced by a variety of factors. Large densities of Grass Carp within ecosystems that primarily rely on trophic inputs from macrophytes are likely to have the most detrimental effects. Grass Carp compete with other grazing fish and invertebrates, and this in turn may disrupt food webs. Diminished macrophyte cover by Grass Carp grazing may also impact the spawning habitat of certain native fish species.

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## Management

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Management Goals: Because Bighead Carp, Silver Carp, and Black Carp have yet to establish within Pennsylvania, the ultimate goal is to prevent their invasion/establishment in the state. Given the proximity of Bighead Carp to the Pennsylvania border and positive eDNA results in Pennsylvania waters, it appears this species may soon reach or may already have reached Pennsylvania waters. However, it should be noted that Bighead Carp appear to occur in very low densities in the vicinity of the Pennsylvania border, and the time for the population to achieve sizes that may impact Pennsylvania fisheries may take decades.

If establishment of any Bighead Carp, Silver Carp, or Black Carp occurs, the goals will then become to eradicate the fish or, more likely, manage these species to mitigate any damage they may cause. Grass Carp are already present in Pennsylvania waters. Therefore, the goal for this species should be to conduct surveys of their distribution and potential impacts in order to contain and manage populations.

Prevention Actions: Regular monitoring by early detection trapping and eDNA sampling is occurring in the vicinity of the Ohio River's Pennsylvania border. Discussion and evaluation by multiple entities is in progress regarding the feasibility of a barrier within the Ohio River. Potential release by humans near larger population centers also needs to be monitored. The following prevention measures are either recommended or presently in effect:



1. Continue to communicate and coordinate regularly with government agencies and academia to ascertain the status of Invasive Carp populations in the Ohio River and Great Lakes.
2. If a barrier on the Ohio River is determined to be feasible, work towards the determination of potential in or out of state locations and potential sources of funding.
3. Continue a public education effort to acquaint the populace with the threat of Invasive Carp in collaboration with PA Sea Grant and other applicable partners.
4. Encourage the incident reporting of aquatic invasive species such as Invasive Carp within Pennsylvania. Online reporting can now be conducted at the following PFBC web site:  
<https://pfbc.pa.gov/forms/reportAIS.htm>  
and at:  
<https://www.paimapinvasives.org/> and  
Nationally at:  
<https://nas.er.usgs.gov/SightingReport.aspx>
5. Strictly enforce Invasive Carp regulations within 58 Pa. Code § 71.6 and § 73.1
6. Continue early detection trapping and eDNA surveys within the Ohio River.
7. Conduct studies in collaboration with appropriate entities to better determine

the distribution and abundance of Diploid Grass Carp populations in Pennsylvania, such as within Lake Erie.

8. Support or initiate studies that evaluate the ecological impact of Diploid Grass Carp populations in Pennsylvania.

#### Rapid Response Options:

1. Coordinate a Rapid Response for any Invasive Carp detections using the Pennsylvania state plan as a model.
2. Implement eradication of Invasive Carp populations where applicable.

Post Invasion Management: If preventative and rapid response measures fail, the following actions should be considered:

1. Continue public education programs.
2. Investigate Invasive Carp reproductive and genetic control strategies.
3. Investigate the feasibility of pheromone trapping.
4. Use the results of current Federal research programs as guidance.

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