

LAKE ERIE GRASS CARP



**RESPONSE
STRATEGY**
(2019 – 2023)



OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WILDLIFE
wildohio.gov

Mission Statement:

The mission of the Ohio Department of Natural Resources (ODNR) Division of Wildlife is to conserve and improve fish and wildlife resources and their habitats for sustainable use and appreciation by all.

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Executive Summary

The *Lake Erie Grass Carp Response Strategy: 2019 – 2023*, describes the Ohio Department of Natural Resources, Division of Wildlife (DOW) strategy to prevent Grass Carp expansion beyond western Lake Erie, the Maumee and Sandusky rivers. Grass Carp are herbivorous and exist in Ohio in two forms. Diploid Grass Carp can reproduce, are illegal to possess in Ohio, and are undesirable due to their potential to damage habitats, alter fish communities and degrade ecosystems. Triploid Grass Carp are genetically altered, cannot reproduce, and are routinely, and legally, used in small lakes and ponds to control aquatic vegetation as an alternative to chemical methods. Recent findings of diploid Grass Carp in western Lake Erie and the Maumee and Sandusky rivers pose a serious threat to Lake Erie and the Great Lakes. Documentation of diploid Grass Carp in Lake Erie and successful reproduction in the Sandusky and Maumee rivers is an immediate concern. This plan was developed to provide a foundation for on-the-ground efforts to address Grass Carp reproduction in these rivers and population expansion in Lake Erie. It is adaptive and informed by current and emerging science; therefore, it will be revised as necessary. Response actions include two outcomes (goals) with supporting objectives and strategies.

Outcome 1: The introduction and expansion of reproductively viable (diploid) Grass Carp is prevented beyond western Lake Erie and the Maumee and Sandusky rivers. Objectives include:

- **Objective 1.1** – Secure the aquaculture supply chain through routine annual inspections to ensure that only triploid (sterile) fish are available.
- **Objective 1.2** – Ensure a secure bait trade through annual surveillance of the bait industry and outreach to reduce the risk of Grass Carp being inadvertently released into the wild.
- **Objective 1.3** – Close knowledge gaps and better understand the life history of Grass Carp by annually monitoring their presence, refining strategies to minimize expansion, and identifying effective approaches to reduce populations.

Outcome 2: Strategies are implemented by the DOW and partners to prevent Grass Carp populations in Ohio waters from reaching levels that compromise aquatic communities as informed through a Structured Decision-Making (SDM) process and ongoing science. The Objectives include:

- **Objective 2.1** – Work with partners to implement annual removal of 390 Grass Carp from Lake Erie to suppress range expansion, as recommended by the SDM process.
- **Objective 2.2** – Enlist the aid of commercial fishers to annually monitor abundance, distribution and assist in achieving annual objectives for removal of Grass Carp.
- **Objective 2.3** – Complete an evaluation of potential barriers to limit reproduction and recruitment in the Sandusky and Maumee rivers.

The Great Lakes Restoration Initiative is the anticipated source of funding for this strategy.

Introduction

The term “invasive carp” commonly refers to a select group of cyprinid fishes (minnow family) that are native to Asia. The United States Fish and Wildlife Service (USFWS) specifically use “invasive carp” to refer to Bighead Carp *Hypophthalmichthys nobilis*, Silver Carp *Hypophthalmichthys molitrix*, Black Carp *Mylopharyngodon piceus* and Grass Carp (also known as White Amur) *Ctenopharyngodon idella*. Each was intentionally introduced into the United States as a biological control. All potentially threaten Ohio’s fisheries and aquatic ecosystems. Bighead Carp and Silver Carp are increasingly present in the Ohio River, with the greatest populations in the westernmost reaches. Grass Carp have been found throughout Ohio; however, findings of diploid Grass Carp capable of reproducing have been rare and limited to western Lake Erie, the Maumee and Sandusky rivers.

Grass Carp were imported into Alabama and Arkansas aquaculture facilities in 1963 to control vegetation in rearing ponds (Mitchell and Kelly 2006). They were widely stocked, and range expansion resulted from intentional and accidental releases. Escapes of captive fish and the intentional stocking of diploid fish promoted their spread across the US (Guillory and Gasaway 1978). Concern over potential ecological consequences led to the development of a sterile, non-reproductive form (triploid) used for vegetation control (Mitchel and Kelly 2006). Shortly thereafter, a commercial hatchery in Arkansas developed a commercially viable process for creating triploid Grass Carp that has led to sales of over 400,000 triploid Grass Carp per year in at least 30 states (Conover et al. 2007). Importation of triploid Grass Carp is permitted by the USFWS in order to track shipments and sophisticated ploidy testing is routine at production facilities.

Ohio law established in Ohio Administrative Code (OAC) does not permit importation of diploid Grass Carp (OAC 1501:31-19-01); however, importation of certified triploid Grass Carp (OAC 1501:31-19-01), incapable of reproduction, to control vegetation has been legal since 1988. OAC stipulates that individuals who import or sell triploid Grass Carp can only sell fish that are certified as triploid by the USFWS. Triploid Grass Carp offer a biological control for vegetation that is cost-effective and reduces the need for chemical vegetation control measures. Legalization of triploid Grass Carp minimized concerns about their ecological impact should they escape containment where they are stocked and has likely reduced the illegal importation of diploid fish. Presently, Grass Carp stocking is prohibited or restricted to triploid fish in US states and Canadian provinces bordering the Great Lakes; however, some central and southern U.S. states continue to allow the stocking of the diploid fish (Conover et al. 2007).

Grass Carp are herbivorous and have the potential to negatively impact native fish communities in the Great Lakes through habitat destruction when abundant (DFO 2017). Given the documented reproduction of Grass Carp in large rivers, they could compromise aquatic ecosystems in Ohio rivers, streams, and Lake Erie migrating waterfowl and other water birds that rely on submersed aquatic vegetation.

Grass Carp were detected in Lake Erie as early as the mid-1980s, but since some jurisdictions allow the stocking of triploid (sterile) Grass Carp it was assumed that these intermittent captures were escaped sterile fish. Concerns associated with Grass Carp were elevated in Michigan and Ohio in 2012 when feral fish tested were found to be diploid. Between 2013 and 2017, a joint effort with commercial fishers resulted in the capture of 83 grass carp in western Lake Erie which were found to be of multiple size classes, indicative of multiple stocking events or natural recruitment. These results were later corroborated by research conducted by Central Michigan University and USGS which determined that greater than 80% of grass carp captured in Lake Erie were fertile and that spawning had occurred in the Sandusky River.

These findings resulted in the need for cooperative, deliberate and planned actions. The potential expansion of diploid Grass Carp poses adverse impacts to native habitats, ecosystem integrity and ultimately sport fisheries and commercial fisheries, water birds and waterfowl. Actions described in this plan are intended to prevent Grass Carp expansion and population growth through science-based adaptive management.

II. History of Grass Carp and Response Actions in Ohio Waters

Grass Carp have been incidentally captured by commercial netters in the lower Sandusky River, downstream of Fremont, Ohio for over a decade. Historic captures within the Great Lakes basin were believed to be escaped triploid stockings, posing little threat to native ecosystems. However, ploidy testing since 2012 has determined that a high proportion of Grass Carp in the system are diploid and capable of reproduction (Chapman et al. 2013; Wieringa et al. 2016), leading to regional concern.

In 2012, the DOW began testing ploidy status of individual fish captured during agency fish surveys and by commercial netters. All samples collected have been tested for ploidy by the USGS National Wetlands Research Center in Lafayette, Louisiana, or the USFWS Whitney Genetics Laboratory in La Crosse, Wisconsin. Ploidy status of individual Grass Carp was determined using flow cytometry technology as established in Jenkins and Thomas (2007). For determining ploidy of feral Grass Carp, cells from the vitreous humor (fluid taken from the eye) are used and sample collection and preparation followed the standard operating procedure supplied by USGS National Wetlands Research Center. In 2012, 10 Grass Carp collected from Lake Erie and the Sandusky River in commercial trap nets and seines were tested; five were confirmed as diploid, two were confirmed triploid, one was undetermined, and two were not tested due to equipment malfunctions.

Beginning in 2013, DOW staff initiated statewide ploidy testing of Grass Carp incidentally captured during standard fish surveys and commercial fishing operations in waters where triploid fish were not stocked for vegetation control. All samples were tested using flow cytometry at the USFWS Whitney Genetics Laboratory. Additionally, fin clips and otoliths were analyzed to understand origins of wild-caught Grass Carp. To further these efforts, the DOW updated Lake Erie commercial fishery catch reporting software to include grid-specific reporting

on Grass Carp landed and added Grass Carp to the list of species that can be commercially harvested.

Evidence, including ploidy testing, fish size and age, and otolith microchemistry suggest that Grass Carp collected in the Sandusky River during 2012 resulted from successful reproduction (Chapman et al 2013). Although the first indication of natural reproduction of Grass Carp in Ohio, evaluation of fertility through ploidy testing did not begin until 2012. Grass Carp have been observed in the Ohio portion of Lake Erie since 1984; therefore, it is possible that diploid Grass Carp have been in Lake Erie for decades. An episodic flooding event, like that in the Western Basin of Lake Erie during 2011, may have established conditions suitable for reproduction.

In 2015, researchers began collecting ichthyoplankton in the Sandusky River and observed seven eggs during or immediately-after high-flow events (Embke et al. 2016). In 2017, seven Grass Carp implanted with acoustic transmitters were detected on a real-time hydrophone operated by the US Geological Survey (USGS) during a high-flow event May 29-June 1. Subsequent sampling resulted in collection of several hundred Grass Carp eggs at multiple locations between Brady's Island near Fremont and Wightman's Grove. A single adult Grass Carp was detected during a secondary flow event on July 8-9 and eggs also were collected during a flow event on July 12. These results indicate that Grass Carp are using the Sandusky River to spawn, but it is unclear if they are successfully recruiting to the population. Subsequent flow modeling suggests that Grass Carp spawning in the Sandusky River occurs between Brady's Island and the former site of the Ballville Dam located in Fremont, Ohio. Diploid Grass Carp are not unique to the Ohio portion of Lake Erie or the Great Lakes. They have also been documented in the Michigan portion of Lake Erie near the Detroit Edison Monroe Power Plant and several locations in Lake Calumet and tributaries of Lake Michigan (Marion Wittmann, UND, personal communication).

On June 13 and 26, 2018, a sampling crew from The University of Toledo (UT) collaborating with USGS, collected six Grass Carp from the Maumee River in Toledo, Ohio. The larval Grass Carp were collected near the I-280 bridge during high water flow events typical of spawning conditions for Grass Carp. These young fish were the first Grass Carp collected in their larval stage from within the Great Lakes watershed and now confirms that all Grass Carp life stages have been documented in the Western Basin of Lake Erie (eggs, larvae, juveniles and adults).

The DOW has also participated in efforts by USGS, UT, and Michigan Department of Natural Resources (MDNR) to learn more about Grass Carp life history and movement. Efforts by USGS and UT include sampling for Grass Carp eggs and larvae in Lake Erie tributaries in the western basin to determine the extent and location of spawning. Through a collaboration with MDNR and USGS, 50 wild-caught Grass Carp were implanted with acoustic tags and their movements are being monitored by both fixed and real-time receivers. Due to the loss of previously-tagged Grass Carp, additional fish will be implanted with tags and released to maintain a tagged population at 50 fish. All these efforts will allow the DOW and partner agencies to better

understand management options by having real-time information on Grass Carp locations and when they are in tributaries where they are susceptible to standard fishing gear.

Grass Carp Supply Chain Monitoring. An issue regarding Grass Carp in Ohio is that fish transported and sold as triploids could be diploids, or mixed with diploids, and could escape waters where they were stocked and establish reproducing populations. To assess the Grass Carp supply chain in Ohio, a 2-year undercover operation was undertaken in 2015 and 2016. A total of 1,200 Grass Carp were covertly purchased for selected suppliers in Ohio and tested for ploidy by the USGS National Wetlands Research Center in Lafayette, Louisiana (Kinter et al. 2018). All fish tested were triploid which indicates that the Ohio supply chain was secure during the project period. Continued monitoring of imported Grass Carp through a permit process and testing of ploidy status of imported fish, along with testing of Lake Erie watershed wild-caught fish, will continue as described in this document.

Sandusky River Grass Carp Planned Action: 2017, 2018, and 2019. During August 28 –31, 2017 and June 12–14, 2018, multiple agencies and organizations participated in planned actions that were successful in removal of Grass Carp and informing research about movement and habitat use.

In 2017, 19.6 hours of gill netting, 13.9 hours of trammel netting, 25.6 hours of electrofishing, and 96 hours of mini fyke netting in the Sandusky River resulted in the capture of eight Grass Carp with combined net and electrofishing methods where fish were chased into nets.

In 2018, 70.5 hours of electrofishing and 63.7 hours of trammel net effort in the Sandusky and Maumee Rivers resulted in the capture of 31 grass carp; 21 of which were removed (20 from the Sandusky and one from the Maumee), one recaptured fish (tagged in 2016 near Maumee Bay and captured/released in the Sandusky) that was returned for continued tracking, and nine fish implanted with transmitters (seven in the Sandusky and two in the Maumee) for tracking as part of continued efforts to understand movement and inform long-term removal efforts. Due to high flows limiting the effectiveness of trammel nets, most the fish were collected using multiple electrofishing boats.

The Sandusky River Grass Carp Planned Actions had multiple desired outcomes. Overall these collaborative multi-agency approaches helped assess Grass Carp sampling (removal) methodologies, increased staff preparedness and familiarity with sampling methodologies, and increased information about population demographics in the Sandusky River and western Lake Erie (Weimer 2018). Specifically, this allowed us to: 1) evaluate the utility of various gears for targeted collections in the Sandusky River; 2) increase proficiency with multiple gears in lotic habitats; 3) increase demographic information on distribution, size composition, ploidy, and relative abundance of Grass Carp in the Sandusky River and western Lake Erie; and 4) remove Grass Carp from the Sandusky River.

Starting in 2019, DOW will transition from planned actions to the deployment of a dedicated Grass Carp Strike Team in partnership with UT. This team will be comprised of a UT lead worker

and three seasonal staff from DOW. This team will be dedicated to Grass Carp removal efforts and will work with similar teams from MDNR and USFWS.

Structured Decision-Making (SDM) Process. The goal of the Grass Carp SDM was to collaboratively develop an adaptive management strategy to control/eradicate the Grass Carp population in Lake Erie, with the flexibility to update management actions with increasing knowledge about the system. Through this process, we will be able to address areas of uncertainty in the decision-making process by using a variety of gear types to evaluate Grass Carp catchability while conducting targeted removal efforts.

The SDM process will help collaboratively identify a management strategy while taking into consideration the stakeholders (i.e., agencies and universities) values in the process, ultimately aiding in cohesive implementation. Through the adaptive management process, control efforts will also provide essential information about Grass Carp abundance, movement, and catchability that can be used to inform future management decisions.

III. Outcomes, Objectives and Strategies

It is critical that the DOW response to Grass Carp be adaptive, consistent with agency authority and responsibility, and sustainable. Completion of adaptive response actions described in this section are contingent upon identification of and successful award of funding. The current funding source for actions is the Great Lakes Restoration Initiative.

Adaptive approaches are essential to capitalize on new information or perspectives, whether derived from lessons learned through experimental management, collaborative insights, closing knowledge gaps, research, or discovery. Agency authority and responsibility identified in Ohio Revised Code (ORC) and OAC present legal sideboards associated with laws, regulations, and authority that must be considered. Sustainable, cost-effective approaches are essential because Grass Carp present a long-term threat to many Ohio water bodies that the DOW manages. Therefore, tactical responses must be prudent and cannot tax agency resources to an extent that compromises the agency's mission and core responsibilities to manage fish and wildlife. Collaboration with partner agencies, federal support, and benefits from existing agency and partner work is critical to ensuring that an effective and meaningful response to Grass Carp in Ohio is possible and sustainable.

This plan addresses currently identified issues caused by Grass Carp. This Response Strategy plan has two outcomes, six objectives, and 13 strategies. Cost estimates to complete each of the strategies are in Table 1.

Issue: *Diploid Grass Carp are reproducing in Lake Erie.* Actions outlined in this section are intended to prevent diploid Grass Carp from becoming established in Lake Erie and its tributaries, as continued reproductive success may allow feral populations to become abundant and negatively affect native habitats, ecosystem integrity, and sport and commercial fisheries.

Our intent is to prevent Grass Carp from attaining densities that cause adverse impacts by a science-based, adaptive management approach to guide decision-making.

- **Outcome 1: The introduction and expansion of reproductively viable (diploid) Grass Carp is prevented beyond western Lake Erie and the Maumee and Sandusky rivers.**
 - **Objective 1.1 - Secure the aquaculture supply chain through routine annual inspections to ensure that only triploid (sterile) fish are available:** There is the potential for diploid (fertile) Grass Carp to be in the commerce supply chain and there is a risk of these fish being inadvertently released into the wild. To reduce this risk, DOW Law Enforcement and Fish Management Sections will monitor the supply chain for ploidy status of Grass Carp available for sale in Ohio to ensure that only triploid (sterile) fish are available.
 - **Strategy 1.1.1 – Conduct Random Sampling of Supply Chain:** Build upon earlier efforts to randomly sample sales during April through October to covertly test ploidy status of Grass Carp from 10 Grass Carp facilities annually (10 fish per sample, 100 fish total).
 - **Objective 1.2 - Ensure a secure bait trade through annual surveillance of the bait industry and outreach to reduce the risk of Grass Carp being inadvertently released into the wild:** There is the potential for diploid Grass Carp (as well as other AIS) to be in the bait trade and there is a risk of these fish being inadvertently released into the wild. To reduce this risk, routine surveillance of the bait industry will be implemented, and outreach efforts will be implemented.
 - **Strategy 1.2.1 – Bait Trade Surveillance:** Continue annual surveillance of bait outlets through our Law Enforcement Section to screen for potential invasive aquatic species including Grass Carp through annual inspection of 25 percent of the bait outlets with every outlet having a mandatory inspection once every four years.
 - **Strategy 1.2.2 – Bait Trade Outreach:** Continue to provide outreach material to bait outlets to assist with self-monitoring of AIS, including Grass Carp.
 - **Strategy 1.2.3 – Angler Outreach:** Continue annual partnership with Wildlife Forever on the “Trash Unused Bait” campaign to provide funding for six billboards along the Lake Erie coastline and half-page ads in the Ohio Outdoor News from April through October.
 - **Objective 1.3 – Close knowledge gaps and better understand the life history of Grass Carp by annually monitoring their presence, refining strategies to minimize expansion, and identifying effective approaches to reduce populations:** The number, spatial distribution, preferred habitats, and biology of Grass Carp in Lake Erie is unknown; consequently, there is a need to monitor their presence and possible population expansion to help focus eradication and population reduction strategies.

- **Strategy 1.3.1 – Monitor Populations:** Monitor Grass Carp presence through: 1) routine fisheries surveys, 2) targeted sampling in locations of likely aggregations at appropriate times, and 3) monitoring commercial netters to better inform estimates of Grass Carp population size and distribution.
 - **Strategy 1.3.2 – Monitor Movement:** Continue to collaborate with MDNR to radio tag Grass Carp to monitor their movement in Lake Erie (and the Great Lakes) and selected tributaries through the GLATOS system and through real-time receivers. Deploy additional receivers to provide finer-scale resolution on Grass Carp movements / locations and to track real-time movements in the Sandusky River, Maumee River and other selected tributaries; and investigate the use of mobile tracking.
 - **Strategy 1.3.3 – Determine Detection Probability:** To assist with our efforts to collect Grass Carp, we will initiate a two-year study with UT to develop a model to accurately estimate the detection probability of Grass Carp. This model will help refine eradication and control efforts and provide a better estimate of population size.
 - **Strategy 1.3.4 – Assess Reproduction:** Continue to collaborate with UT and USGS to monitor for Grass Carp reproduction in the Sandusky River, Maumee River, and other selected tributaries by sampling for eggs and larvae as determined by habitat and flow characteristics.
- **Outcome 2: Strategies are implemented by the DOW and partners to prevent Grass Carp populations in Ohio waters from reaching levels that compromise aquatic communities as informed through a SDM process and ongoing science.**
 - **Objective 2.1 – Work with partners to implement annual removal of 390 Grass Carp from Lake Erie to suppress range expansion, as recommended by the SDM process:** The SDM process suggested that annual removal of 390 Grass Carp could suppress range expansion. We will work with our partners to better understand our ability to remove this number annually from Lake Erie and this estimate will be adjusted as new information updates the model.
 - **Strategy 2.1.1 – Develop Sustainable, Cost-Effective, Long-Term Removal Program:** Using the information learned from Ohio’s planned actions in 2017 and 2018, develop a long-term Grass Carp removal strategy through the development of a Grass Carp Strike Team through a partnership with the UT to focus on future Grass Carp control activities. The Ohio team will work closely with similar teams housed within the MDNR and USFWS.
 - **Objective 2.2 – Enlist the aid of commercial fish netters to annually monitor abundance, distribution and assist in achieving annual objectives for removal of Grass Carp:** Commercial netters have provided an important indicator of Grass Carp abundance and distribution, and further utilization of the fishery will be considered.
 - **Strategy 2.2.1:** Partner with commercial fishers to strengthen Grass Carp reporting by incentivizing individuals turned in to the DOW.

- **Objective 2.3 – Complete an evaluation of potential barriers to limit reproduction and recruitment in the Sandusky and Maumee Rivers:** There may be an opportunity to prevent Grass Carp from reaching suitable spawning areas using physical and behavioral barriers, or to remove fish using a selective fish passage system.
 - **Strategy 2.3.1: Conduct a Barrier Feasibility Study** - Identify a suitable entity to conduct a study to evaluate existing conditions on the Sandusky and Maumee Rivers to determine the feasibility of a temporary or permanent barrier in these rivers. The study will evaluate potential barrier types and determine how and where they might be used to block movements of Grass Carp and/or support population reduction actions.
 - **Strategy 2.3.2: Develop a Barrier Design** – If the study identified above concludes that a barrier system is workable, cost-effective, and sustainable; then a qualified engineer will develop a barrier design. Funding and construction of a barrier would be considered in 2021.
 - **Strategy 2.3.3: Consider New Technologies for Implementation** - Evaluate control technologies being developed by the USGS for use on Grass Carp in Lake Erie. Deploy as deemed necessary, relevant, and appropriate based on economic feasibility, ease of implementation, and available funding. Implementation could potentially occur within the bounds of this plan, pending identification of a funding source.

IV. Communication, Coordination and Cooperation

Actions of the DOW are part of a coordinated national response to the invasive carp invasion. Issues related to AIS transcend the responsibility and authority of a single authority or agency. Therefore, the DOW will effectively communicate internally and externally through prescribed strategies to share new information, clarify rationale for necessary actions or responses, and address emerging concerns. This will be accomplished through existing organizations with established communication frameworks.

Grass Carp in the Western Basin of Lake Erie is a multi-jurisdictional issue; therefore, good communication, coordination and cooperation between state, provincial and federal agencies, universities and other partners is essential. Fluid dialog, planning, strategy sessions, joint exercises, face-to-face meetings, conference calls and routine correspondence via e-mail and phone are vital as information continues to emerge, management approaches adapt, and resources are sought to address Grass Carp issues. A focus on applied science that promote strategies in this plan is of great importance to the DOW and synergy between managers (DOW, MDNR, USFWS, Ontario Ministry of Natural Resources, and the Department of Fisheries and Oceans Canada) and researchers (USGS and universities) should facilitate such efforts.

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Table 1: Schedule and Budget for DOW 5-year Lake Erie Grass Carp Response Strategy (2019-2023)

Outcome	Objective	#	Strategy	2019	2020	2021	2022	2023	
Prevent Further Introduction and Expansion to Waters Besides Lake Erie	Secure Aquaculture Supply Chain	1.1.1	Monitor Supply Chain	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	
	Insure Secure Bait Trade	1.2.1	Bait Trade Surveillance	\$15,000	\$15,000	\$15,000	\$15,000	\$15,000	
		1.2.2	Bait Trade Outreach	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	
		1.2.3	Angler Outreach	\$20,000	\$20,000	\$20,000	\$20,000	\$20,000	
	Better Understand Life History	1.3.1	Monitor Population	\$20,000	\$20,000	\$20,000	\$20,000	\$20,000	
		1.3.2	Monitor Movement	\$50,000	\$50,000	\$10,000	\$10,000	\$10,000	
		1.3.3	Detection Probability	\$83,000	\$83,000	\$0	\$0	\$0	
		1.3.4	Assess Reproduction	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	
	Implement Strategies to Reduce Grass Carp Populations in Ohio Waters to Acceptable Levels	Removal and Prevention	2.1.1	Long-Term Grass Carp Strategy	\$125,000	\$125,000	\$125,000	\$125,000	\$125,000
		Engage Commercial Netters	2.2.1	Partner with Commercial Fishers	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000
Barrier Feasibility Study and Design		2.3.1	Conduct a Barrier Feasibility Study	\$0	\$200,000	\$0	\$0	\$0	
		2.3.2	Develop Barrier Design	\$0	\$0	TBD	TBD	TBD	
		2.3.3	Evaluate control technologies being developed by the USGS	TBD	TBD	TBD	TBD	TBD	
TOTAL				\$533,000	\$308,000	\$213,000	\$213,000	\$213,000	