

Grass Carp Advisory Committee (GCAC)

Annual Report 2025

This report was collaboratively prepared by all GCAC members and Task Group Leads.

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GCAC Overview

The Grass Carp Advisory Committee (GCAC) is a technical committee reporting to the Council of Lake Committees. It coordinates regional efforts to seek eradication of Grass Carp in Lake Erie, if possible, while also maintaining surveillance where appropriate in other lakes to: 1) Coordinate actions that address specific Lake Erie Committee (LEC) Grass Carp Adaptive Response Strategy priorities, 2) Develop coordinated approaches to address uncertainties identified by the LEC, 3) Provide recommendations about additional uncertainties that should be addressed, and 4) Coordinate surveillance throughout the Great Lakes.

GCAC Meetings and Initiatives

In the past year, the Grass Carp Advisory Committee (GCAC) convened two meetings, both of which took place in Ann Arbor, Michigan. These meetings provided a platform for comprehensive updates from each task group, as well as project-specific reports and targeted discussions.

A key initiative of GCAC focused on monitoring progress in relation to the objectives specified in the response plan. This undertaking has been completed, resulting in the establishment of precise metrics to assess advancement. Each Task Group provides details on these metrics within their respective sections. A summary of these metrics and their current status can be found in Table 1.

The committee continued its focus on environmental DNA (eDNA) and otolith microchemistry, dedicating significant attention to these topics throughout the year. Additionally, there was an ongoing effort to revisit ploidy determination for historic grass carp samples. To facilitate deeper exploration of eDNA and otolith microchemistry, the GCAC established dedicated working groups tasked with guiding discussions and advancing understanding in these critical areas.

Table 1. Performance metrics established by the GCAC to track progress as it relates to the Lake Erie Grass Carp Adaptive Response Strategy. This table also includes the 2025 report out by each Task Group.

Metric	Definition	GCAC Task Group Lead	2025 Status
1a) Total Grass Carp Removed	Total fish removed, % diploid, and % of target annual diploid removals (n=373)	Field Work	1a) 199
1b) Percent Diploid			1b) 70.9 %
1c) Percent of Target			1c) 37.8%
2) Sustained response CPE by site	Catch per unit effort of sustained surveys by location	Field Work	2) Varies by gear and location; see Table 2.
3) Stakeholder complaints during control efforts in 2025	Number of total and unique complaints from stakeholders	Field Work	3) n=1
4) Adults captured during spawning events in 2025	Number and/or catch per unit effort of grass carp captured during spawning events in the Maumee and Sandusky rivers	Early Life History	4) 0
5) Proportion of time egg sampling during probable spawning conditions	The proportion of time egg sampling has taken place during probable spawning conditions by river	Early Life History	5) 3.8% (Sandusky)
6) Mortality	Estimation of fishing and total mortality via catch curves, close-kin mark-recapture, and length-based estimates	Modeling	6) 13.6% (2021)
7) Year class strength via vertebrate aging	Visual representation of year classes based on aged grass carp.	Field Work + Modeling	7) TBD

8) Estimated population abundance in spawning rivers	Estimate abundance in the Maumee and Sandusky rivers using multiple modeling techniques.	Modeling	8) TBD; Models/Manuscript Under Review
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Field Work Task Group

Field crews captured 206 grass carp across Great Lakes tributaries, harvesting 199 and recapturing and releasing 7 tagged fish. The Sandusky River yielded 72% (149) and the Maumee River 19% (39) of captures, together making up 91% of total catches. These rivers received most of the sampling effort, with the Sandusky and Maumee accounting for 533 out of 628 gill net sets and 225.82 of 526.62 electrofishing hours. Most fish caught in these rivers were diploid (Sandusky 88.4%, Maumee 60.6%), with no diploids found elsewhere in 2025. Due to their high export risk of reproductively viable fish, these rivers remain top priorities for removal efforts.

Grass carp continue to be found in new areas outside Lake Erie's western basin. In 2025, the project recorded its first grass carp from Lake Ontario's Irondequoit Bay and the Buffalo River in eastern Lake Erie, both previously unreported locations. A total of 12 grass carp have been captured near Buffalo Harbor since 2022. The first confirmed grass carp in Wisconsin's Fox River was also documented in 2025, with limited information due to poor specimen condition. In 2025, 10 grass carp were captured in eastern Lake Erie and its tributaries, and 5 in Lake Michigan tributaries—all from sites with prior captures. High catch rates were seen in Presque Isle Bay, PA using 8.5" stretch gill nets. All grass carp found outside the western basin were sterile, triploid fish, indicating no range expansion.

Field crews conducted a gear comparison study in the Sandusky River to identify the most effective passive gear to target grass carp. Gill nets of two mesh sizes (8.5" stretch and 10" stretch) and two sizes of hoop nets (3' and 5' openings) were compared over three trials from June to October. Boat electrofishing was conducted during the day in the same areas to compare passive gear with an active fishing method. Passive gear was also checked twice daily to compare day vs. night captures, given that grass carp are known to move more at night (Bonjour et al. 2024). The 8.5" stretch gill nets fished overnight captured the most grass carp, and only gill nets captured grass carp in any trial. The final trial in October was affected by drought conditions and low water levels, resulting in no grass carp captures. This information is being used to guide another year of data collection for the gear comparison study in 2026. We will eliminate hoop nets, conduct boat electrofishing at night instead of during the day, test additional gill-net mesh sizes, and experiment with shorter set times to identify the most efficient way to maximize catch while minimizing effort.

Sustained sampling CPE remains near zero and shows no evidence of grass carp population increase or change in distribution (Table 2). Gill nets were added to some sustained sampling to compare the different methods (electrofishing vs gill nets) in an attempt to be able to compare catch data from different methods. As gill nets become more prevalent and it becomes more likely that future sustained sampling will be done using this method it is important to have some side-by-side comparison of the two methods to link past and future sustained data. Gill net CPUE was higher than electrofishing but uneven (75% of all sustained gill net captures came from one net) highlighting the difficulty of capturing mobile fish.

In 2025, only one stakeholder complaint was recorded when a cruise ship ran over a net in the Maumee River. The issue was resolved, and crews now avoid the ship's route. Fewer than 10 nets were disturbed or damaged all year, reflecting a net encounter rate of less than 1%. Crews regularly coordinate with other river users to set nets efficiently and minimize conflicts while removing grass carp.

Grass carp removal in the Great Lakes is ongoing and improving. While diploid captures are below targets (141 of 373), there's no sign of population growth. The Sandusky and Maumee rivers remain primary focus areas due to their higher grass carp risk, but surveillance elsewhere helps spot new threats. Intensive removal will continue in key tributaries through 2026, with sampling in expansion zones and efforts to enhance removal gear.

Table 2. Grass Carp sustained sampling Catch Per Unit Effort (CPE) for locations sampled in 2025. Electrofishing CPE is reported as grass carp/electrofishing hour; gill net CPE is reported as grass carp/net set.

Location	Electrofishing	Gill Net
Buffalo Harbor	0	N/A
Maumee River 1	0	0
Maumee River 2	0	0.11
Maumee River 3	0	0
Maumee River 4	0	0
Maumee River 5	0	0
Maumee River 6	0	0
North Maumee Bay	0	N/A
Plum Creek	0	N/A
Sandusky River 1	0	0.5
Sandusky River 2	0	0.5
Sandusky River 3	0	0
St. Joseph (MI)	0.12	N/A
Trenton Channel	0	N/A

Early Life History Task Group

Ichthyoplankton surveys in 2025 investigated grass carp spawning in Great Lakes tributaries on both sides of the border. Genetically confirmed grass carp eggs were found twice in U.S.

waters—on May 16 in the Sandusky River and June 20 in the Huron River, marking the second confirmed spawning in the latter. No new spawning rivers were identified that season.

Published results:

Grass carp egg capture data from pilot surveys in 2014, as well as surveys in 2023 and 2024 were made publicly available via a U.S. Geological Survey Data Release which is available at: <https://doi.org/10.5066/P13EURNP>. The data release documents the locations and timing of pilot surveys in the Sandusky River, which did not observe grass carp eggs during 2014. The data release also describes grass carp eggs collected in the Sandusky River on August 25, 2023 and May 1, 2024. A peer-reviewed journal article was also published on the capability of oblique bubble screens to redirect live grass carp eggs and larvae to areas in which they can be efficiently captured and removed. The results suggested that eggs followed the helical currents generated by the oblique bubble screen and may provide an opportunity to design capture methods that capitalize on secondary flows generated by the oblique bubble screen. The work is available at: <https://doi.org/10.1029/2025WR039967>. Members of the Early Life History Task Group also published an article summarizing grass carp early life history research in U.S. waters of the Great Lakes (Available at: <https://doi.org/10.1016/j.jglr.2026.102815>).

Next Steps:

The Early Life History Task Group is conducting several projects to advance understanding of grass carp early life history and support removal efforts. Planned ichthyoplankton surveys on both sides of the Canada-U.S. border aim to pinpoint spawning times and locations in the Great Lakes Basin. Efforts are underway to improve sampling efficiency for eggs and larvae, while crews also collect grass carp gonads to study annual developmental cycles and better assess spawning risk. Collaborative research evaluates methods to gauge spawning readiness through water temperature, including updates to the USGS SpawnCast dashboard (<https://cm.water.usgs.gov/proj/spawncast/>), now featuring additive degree days over 5°C. A broader reach-based version of SpawnCast is being developed. Crews gathered trace element data from Sandusky Bay in July and August 2024 to compare with otolith microchemistry for identifying origins of adult grass carp; analysis is ongoing. Another project investigates grass carp behavior during spawning events to find patterns that could enhance collection and interpretation of ichthyoplankton samples. Researchers also seek to identify traits of rivers where invasive carp spawn, which could help prioritize sampling in Great Lakes tributaries. Ongoing work estimates spawning areas to guide removal efforts, including studies in the Sandusky River—now likely between 11–15 km upstream of the former Ballville Dam—and upcoming egg collection in the Huron River, Ohio in 2025.

Data Management Task Group

Prior to the 2022 field season, we reconfigured Survey123 for the submission of grass carp removal data to create a relational database that automatically connects all data collected as part of each removal attempt by a unique identifier. The five tables associated with this database

are: 1) *event_operations*, considered the “parent” table that all other tables relate to, 2) *effort*, 3) *environment*, 4) *bycatch*, and 5) *grass_carp_harvest*. In 2024, the task group agreed to submit entries within 48 hours of the removal event occurring and each agency quality controls (QC) their entries within 10 business days.

Updates:

Primary data collection forms were updated with new fields in several tables, including gear options, gill net details, bycatch mortality counts, comments, and grass carp harvest information. Unique identifiers for harvested grass carp were consolidated into a single *fish_harvest_UID*. Data collection and QC app training occurred before the field season. Due to federal restrictions, a lab QC app could not be created for 2025, but QC was performed within database tables. Michigan DNR issued weekly and bi-weekly QC reports and collaborated with USFWS to set audit criteria and schedules; results are tracked and archived in R Markdown. The early life history Survey123 form was revised for streamlined entry and consistency with previous years. Michigan DNR launched an ArcGIS StoryMap in 2024, featuring dashboards, data releases, publications, and program overviews, which was linked on the Grass Carp Advisory Committee website and updated with 2025 field data in January 2026.

Integrating data formats (old and new):

The change to a relational database in 2022 required integrating 2020 and 2021 data into our current format. To do so, the University of Toledo manually linked combination (electrofishing and net set) events and their associated data together. After linking events together with unique identifiers, the University of Toledo and USFWS worked together to organize the older data and match field types and names to our current relational database. We then combined the two datasets (2020–2021 & 2022–2023), maintained table relationships, and published them to ArcGIS Online as a feature layer. All Survey123 data collection forms were updated so new collections feed directly into the integrated database. Metadata documentation was started in 2023 and finished in 2024. Additionally, a README document with standardized summaries from the integrated database was finalized in 2024. Several standard operating procedures (SOP) were also created by University of Toledo and USFWS for Grass Carp dissections, aging structure preparation, and aging. These were distributed to all partners for reference.

Next Steps:

Action items for 2026 include finishing standardized summaries for 2018-2019 data, updates to all survey forms based on user input, development of a QC application for verifying dissection and laboratory information, creation of an SOP for aging and quality control of data, and additional data collection and QC training. Additionally, the first public data release will be published in February of 2026. The public grass carp StoryMap will be updated with new manuscripts/news articles as they become available, and dashboards will be updated with 2026 field season data in the winter of 2026/2027.

Modeling Task Group

The Modeling Task Group continues to develop and increase communication with the Field Work Task Group, Telemetry Task Group, and Data Task Group. Communication between these groups is meant to identify questions and needs of those directly working in the field collecting grass carp and make use of the data that have been acquired across GCAC members. Several peer-reviewed publications were released over the past year, with additional manuscripts currently in review or in preparation. The following are updates related to projects that Modeling Task Group members were involved in during 2025.

Federal Context and Funding Updates

Federal workforce disruptions in early 2025 affected staffing continuity across several projects. Staff losses, disruptions from reversed dismissals, and uncertainty around federal funding created near-term challenges; however, staffing impacts did not increase substantively beyond those present at the start of 2025. Shared Computing and Cooperative Agreements, along with other mechanisms, have been employed to ensure project continuity where possible. Longer-term implications include missed opportunities, new budget hurdles, and concerns about the limits of current workarounds.

Despite these challenges, several funding developments supported continued progress in 2026. A new four-year cycle began January 1, 2026 under a renewed USGS CESU agreement (led by Colborne). An application was submitted to CIGLR for a project pairing telemetry data on in-lake movements with biophysical models to identify environmental conditions correlated with grass carp movement in Lake Erie (Colborne). A genetic sourcing project grant was submitted to GLRI for FY2026-2029 funding (Acre). Gear comparison funding was secured for FY2025 and is likely to continue into FY2026 (Acre). USGS redirect funds have also been allocated in support of the presidential memorandum "Protecting the Great Lakes from Invasive Carp." The Great Lakes Fishery Commission (GLFC) provided support for multiple activities including post-doctoral research associate staff time, gear comparison study, USGS-MSU collaborative activities, and genetic processing pending GLRI decisions.

Great Lakes Basin-Wide Distribution Modeling

A model to predict probability of grass carp occurrence throughout Great Lakes tributaries continues to move toward completion. The model leverages presence information from the joint Grass Carp capture database, Fisheries and Oceans Canada, Illinois Natural History Database, Indiana DNR, and non-indigenous aquatic species (NAS) database, and habitat information from the National Hydrography Dataset High Resolution (NHDplus HR) dataset for the northeast United States and Canadian tributaries to the Great Lakes. Preliminary results were disseminated to the GCAC in February 2024. The results of this model are meant to guide exploratory sampling, identify large-scale patterns of distribution, and identify areas considered at high risk of invasion. The project was included as part of the University of Toledo PhD thesis defended by Rob Hunter (with support from Chris Mayer and Matt Acre) in April 2026 and is on track for submission to a peer-reviewed journal.

Multi-Species Individual-Based Bioenergetics Model

The multi-species individual-based model (IBM) developed by Brian Brenton, Joe Krieger, Joe Langan, and collaborators continued to advance through 2025. The model focuses on percids, gizzard shad, smallmouth bass, and grass carp in the Lake Erie western basin and integrates a range of data streams including FluEgg outputs for the Maumee and Sandusky rivers, GLFC annual task group reports for walleye, yellow perch, and prey fish, grass carp diet and movement data, environmental data (streamflow and water temperature), telemetry data, and biological survey data. Results are designed to provide insight into the probability and timing of grass carp establishment in new areas, potential impacts of predator species, the efficacy of targeted harvest, and population trajectories under variable movement, harvest, and early-life survival scenarios.

The final technical report for the Lake Erie component was submitted to NOAA in August 2025. Work is currently underway to revise and extend the model to include the Detroit River, Lake St. Clair, and the Thames River, with additional features to examine grass carp spawning site fidelity, multiple predator species, and habitat preferences. IBM expansion was placed on hold pending resolution of federal funding uncertainties. Data needs identified to improve the model include current grass carp population estimates, mortality estimates for all life stages (particularly larvae and juveniles), habitat preference data, and more detailed information on macrophyte distribution, density, and seasonal growth patterns. This work is led by Brian Brenton and Joe Krieger (NOAA).

Grass Carp Mortality

Lang et al. evaluated whether the Lake Erie grass carp response program is increasing mortality of invasive grass carp, using catch-at-age data from 553 fish collected between 2014 and 2022 and a hierarchical catch-curve modeling approach. The study found that annual mortality was low early in the time series, then increased after removal efforts expanded, rising from approximately 4.3% initially to a peak of 13.6% in 2021. Mortality was also positively related to the number of fish removed each year. These results suggest that the multi-agency strike-team response is contributing to higher adult mortality and is likely helping suppress population expansion, providing an important quantitative indicator beyond annual catch totals alone. At the same time, the authors noted that current mortality rates are still relatively modest given the species' high reproductive potential, so continued and adaptive removal efforts remain warranted.

Removal Method Efficiency

Hunter et al. quantified per vessel hour and per effort removal efficiency between non-spawning electrofishing only and combined (electrofishing around a trammel net) removal efforts using a single vessel in the lower 24 km of the Sandusky River during 2020-2023. Results showed that on average electrofishing only was at least 2.4 times more efficient per vessel hour, with no significant difference in per effort catch rates. Results highlight potential tradeoffs between optimizing for detection versus efficiency for relatively rare fishes when target species distributions are unknown. This manuscript provides an analytical framework for optimizing invasive grass carp capture methods in the Great Lakes. Much of the work for this publication was completed in 2024, but it was published and released in 2025.

Reproductive Biology

Wilson et al. revealed that invasive grass carp in Lake Erie exhibit high reproductive plasticity characterized by batch spawning, asynchronous ovarian development, and indeterminate fecundity, allowing them to spawn multiple times across a protracted season (April to November). These traits, combined with earlier-than-expected age-at-maturity (as young as age-3), higher body condition, and greater fecundity compared to Missouri populations, suggest a heightened risk of population expansion in the Great Lakes. From a management perspective, this underscores the urgency of early detection and removal efforts targeting juveniles before they reach reproductive maturity. Additionally, the establishment of gonadosomatic index (GSI) thresholds for assessing maturity in the field provides managers with a practical tool to rapidly evaluate reproductive potential, improving both risk assessments and the effectiveness of removal programs. Much of the work for this study was completed in 2024, but the publication was released in 2025.

Stock Assessment

The goal of this research is to assess the current stock status of grass carp and evaluate the effectiveness of ongoing management efforts in reducing biomass. Using data from the shared capture database, the project applies three modeling approaches: Length-Based Indicators (LBI), Length-Based Spawning Potential Ratio (LBSPR), and the Length-Based Bayesian Biomass Estimator (LBB). LBI results indicate that over 95% of captured individuals are classified as mega spawners, meaning large, highly fecund fish. While the LBSPR and LBB produced divergent estimates, this discrepancy is likely due to the sensitivity of the LBB model. Notably, LBSPR results highlight a key management gap: the limited capture of young adults and immature fish. This research was paused during 2025 due to federal uncertainty but is being restarted with the goal of presenting updated findings at the summer 2026 GCAC meeting. This work is led by Tammy Wilson with support from Matthew Acre and Michael Byrne.

Abundance Index of Grass Carp Populations

A new project led by postdoctoral researcher Joshua Hoekwater (University of Toledo), with support from Chris Mayer, Matthew Acre, Song Qian, and Scott Colborne, is developing a standardized index of grass carp abundance across space and time to assess the effectiveness of control efforts and inform population management strategies. The approach uses a Hurdle model structure combining Firth's Logistic Regression for the presence-absence component and a Gamma Generalized Linear Model for positive catch data, applied to standardized electrofishing CPUE data from the Maumee and Sandusky rivers.

The analysis addresses the zero-inflated nature of the capture data, which is driven by variability in gear efficiency, gear type, fish abundance, and fish movement. Recognizing that abundance and CPUE are only directly proportional when catchability is constant, the modeling framework incorporates spatially and temporally varying catchability using information from telemetry studies, including behavioral data on backwater occupancy and movement rates from Bonjour et al. (2025). Models have been completed and are undergoing internal review, with manuscript preparation underway.

Sandusky River VPS Projects

The acoustic telemetry positional VPS array in the lower Sandusky River has been in operation seasonally since 2020. Multiple projects continue to work with these data to describe the movements and habitat selection of grass carp in the lower Sandusky River. The VPS arrays provide spatial resolution not possible from the standard acoustic receivers deployed elsewhere in Lake Erie. Three projects were active over the past year:

(1) Hidden Markov Models and Backwater Use

Bonjour et al. used hidden Markov models (HMMs) to uncover fine-scale behavioral patterns of invasive grass carp in the Sandusky River, revealing key mismatches between current removal efforts and fish behavior. The analysis shows that grass carp frequently occupy shallow, vegetated backwater habitats during the day, at times and locations where removal crews using electrofishing are least effective. At night, fish exhibit more directed movements in the main channel, suggesting increased vulnerability to passive gears such as gill nets. These findings highlight the need for adaptive management strategies that exploit diel and habitat-driven patterns, such as shifting removal efforts to nighttime or targeting fish when they exit backwaters. This work was led by Sophia Bonjour and Matt Acre at USGS CERC and was published in the *Journal of Great Lakes Research* in August 2025.

Bonjour, S. M., Hunter, R. D., Roberts, J. J., Brenden, T. O., Colborne, S. F., Faust, M. D., ... & Acre, M. R. (2025). Grass carp (*Ctenopharyngodon idella*) movement states and backwater use can inform removal efforts. *Journal of Great Lakes Research*, 102654.

(2) Hidden Markov Model Sensitivity Analysis Using Simulated VPS Data

A complementary HMM study led by Nick Boucher and Travis Brenden at Michigan State University is focused on identifying environmental conditions corresponding with latent behavioral states in which grass carp are most vulnerable to control efforts. Current work is centered on understanding what level of horizontal positioning error (HPE) is acceptable for use with HMMs and how to address gaps in observations, as HPE filtering and data gap frequency are inversely related tradeoffs. A sensitivity analysis is underway using simulated locations within the lower Sandusky River VPS array across a range of plausible HPE filtering thresholds, either voiding data gaps or simulating paths between detections, with null models fit to evaluate the impacts of these processing steps. Preliminary results indicate that model selection consistently supports HMMs with more behavioral states, and that tag transmission schemes affect the distribution of turning angle and state identification. A draft thesis chapter was sent to the primary advisor in 2025.

(3) Resource Selection Function Analysis

The lower Sandusky River VPS data are also being used to examine patterns of habitat selection through resource selection function (RSF) modeling, led by Alex Maguffee, Scott Colborne, and Travis Brenden. Grass carp positions from 2020-2024 are included in the analysis, with data inspected to ensure sufficient detections per fish. Predictor data including substrate types, depth, distance to shore, and discharge have been assembled. Initial model runs for 2022 were presented

at the August 2025 GCAC meeting. Analyses for additional years using the MSU high-performance computing cluster (HPCC) are ongoing and continue into 2026, with refinement of model scale and scope underway.

Juvenile Grass Carp Effort

An exploratory project led by Sarah Seman and Grant Milne is examining juvenile grass carp captures across the grass carp sampling events database to better understand the early life stage continuum from egg through juvenile to adult. Initial exploration is complete, and incorporation of significant sampling data from USFWS is underway. Results are expected to directly inform field sampling for juveniles and provide a metric that can be incorporated into broader population assessments. Additional USFWS AIS data and juvenile capture records are identified as key data needs to advance this work.

Diet Projects

A metabarcoding study of grass carp stomach contents from Lake Erie and Lake Michigan tributaries is co-led by Ryan Brown, Matthew Acre, and Sophia Bonjour and continues to move toward publication. The study explores unexpected dietary patterns with management implications. While previous assumptions suggested grass carp primarily consume submerged aquatic vegetation (SAV), individuals in the western and central basins of Lake Erie were found to consume mostly terrestrial and terrestrial-wetland plants. In contrast, those in the eastern basin and Lake Michigan appeared to rely more on SAV. These findings suggest that grass carp may be highly flexible in their foraging behavior and could be exploiting food sources associated with urbanization and riparian vegetation. Current removal strategies that focus on aquatic vegetation zones may benefit from reconsideration, and management efforts could be expanded to include areas with high terrestrial input. Revisions were submitted to the *Journal of Great Lakes Research* in early 2026. A data release of diet and environmental data occurred during 2025.

Optimal River Conditions for Spawning and Recruitment

FluEgg modeling to assess the distribution of eggs at hatching and larvae at the gas bladder inflation (GBI) stage across a wide range of streamflows, water temperatures, and spawning locations continues as a key analytical effort linking early life history to management response. Maumee River results were published in LeRoy et al. (2024), and a Sandusky River manuscript is in preparation. Egg and larval drift data from FluEgg simulations serve as input for the NOAA-Brenton IBM models. Progress on this project has been delayed due to the loss of a lead modeler and other staff reductions since early 2025. This work is led by J. LeRoy and R. Jackson, with B. Brenton contributing the IBM component.

Two new FY2026 projects have been initiated under GLRI funding to further leverage existing FluEgg simulation work:

- Fate and Transport of Grass Carp Ichthyoplankton in Sandusky Bay (Jackson and Hilling): This project aims to characterize hydrodynamics of Sandusky Bay across a wide range of environmental conditions using existing computational models to improve understanding of the fate, transport, and recruitment potential of grass carp eggs and larvae within the bay. An

existing EFDC model (2015-2019) has been identified and TetraTech has been engaged to simulate grass carp spawning events and provide particle tracking results.

- **Leveraging FluEgg Simulations to Evaluate Early Life Stage Sampling Practices (LeRoy and Jackson):** This project examines how different sampling strategies may increase detection probability of invasive carp eggs and larvae by analyzing existing drift simulation results in regulated and unregulated river systems. The FY2026 focus is on producing a method to identify locations and depths where egg and larval concentrations are greatest under varying conditions, with application to the Sandusky and Maumee rivers and development of broader sampling guidance. Funding arrived in November 2025 and FY2026 planning is underway.

DFO Early Detection and Surveillance Site Prioritization

A project is underway by Eric Smyth and Andrew Drake to prioritize key locations within the Canadian waters of the Great Lakes for DFO surveillance monitoring. The work is based on the probability of grass carp dispersing to Canadian locations from known sources (e.g., the western basin of Lake Erie) and the suitability of those locations for spawning and feeding and growth. A CSAS process was conducted during 2025, and Eric Smyth is providing a detailed update to the GCAC. An updated Research Document and Science Advice Report is in preparation based on activities during 2025, with anticipated publication through the CSAS office in late 2026 or early 2027.

DFO Grass Carp Catchability Simulations

A simulation model completed by Eric Smyth and Andrew Drake estimates the probability of capture for grass carp by DFO response crews. Simulation models were calibrated against mark-recapture results from a mock field-based response using common carp in Rondeau Bay, Ontario in 2017 and 2018, with various carp dispersal and habitat preference scenarios explored. Estimated probability of capture was highly variable across scenarios and years. A manuscript was submitted to the Canadian Journal of Fisheries and Aquatic Sciences in 2025 but was ultimately rejected following review. Reviewer comments are being addressed and co-authors anticipate resubmission in summer 2026 to Fisheries Management and Ecology.

Other Ongoing Projects

- Fine-scale grass carp distribution mapping (Rob Hunter and Christine Mayer)
- Basin-wide species distribution model (Hunter, Mayer, and Acre)
- Mark-recapture analyses using telemetered fish, revisiting and expanding on previous work (Bopp et al. 2025) with more tags, receivers, and effort for estimation of fisheries mortality rate

Grass Carp Papers Published in 2025

Lang, K., Mayer, C., DuFour, M., Qian, S., Hintz, W. D., Kocovsky, P., ... & Brown, R. (2025). Dead giveaway: Rising mortality rates suggest effectiveness of Lake Erie grass carp (*Ctenopharyngodon idella*) response. *Journal of Great Lakes Research*, 51(4), 102606.

Wilson, T. M., Acre, M. R., Williams III, F., Calfee, R. D., Mayer, C. M., Mapes, R. L., ... & Byrne, M. E. (2025). Reproductive biology of invasive grass carp (*Ctenopharyngodon idella*) in two North American systems. *Journal of Fish Biology*, 107(1), 101-115.

Bonjour, S. M., Hunter, R. D., Roberts, J. J., Brenden, T. O., Colborne, S. F., Faust, M. D., ... & Acre, M. R. (2025). Grass carp (*Ctenopharyngodon idella*) movement states and backwater use can inform removal efforts. *Journal of Great Lakes Research*, 102654.

Hunter, R. D., Qian, S. S., Fischer, J. L., Brown, R., Nathan, L., Dettmers, J. M., ... & Mayer, C. M. (2025). Optimizing per vessel hour capture efficiency for rare, heterogeneously distributed fishes: Invasive grass carp *Ctenopharyngodon idella* in the Sandusky River. *Fisheries Research*, 285, 107344.

Brown, R., Bonjour, S. M., Raines, C. D., Pease, A., Byrne, M. E., Mayer, C. M., ... & Acre, M. R. (2025). Grass Carp diet and environmental data from the Lake Erie and Lake Michigan basins from 2019 to 2022. US Geological Survey (USGS) Data Release, 1404.

Telemetry Task Group

Using detections from 2024 and 2025 there were confirmed to be 35 tagged Grass carp alive and at large whose transmitters have remaining battery life for 2026. These detections show 13 active tags from 2024 experienced mortality or a dropped tag during 2025. Four other 2024 active tags were captured and harvested by strike crews in 2025. No new Grass Carp were tagged in 2025.

The tiered array of acoustic receivers to detect Grass Carp tagged with acoustic telemetry transmitters we maintained in 2025 was similar in distribution and density to 2024. This included a nearshore basin-wide array in Lake Erie (n=72 receivers). The riverine portion of this array included 61 receivers in six high priority tributaries. Within the Sandusky River and Maumee River, we also maintained dense distributions of receivers as part of the fine-scale array which allows us to estimate the 2-dimensional location of tagged Grass Carp when their tag is detected on multiple receivers. Within the Sandusky River this dense array included 74 receivers in only the lower portion of the river. A new dense fine-scale array (n=13 receivers) was deployed during 2025 in the Maumee River close to Farnsworth Metropark. The alert tier of the 2025 Grass Carp array included five near-real-time receiver stations outside important tributary habitats, three real-time receivers in the Sandusky River/Bay, and three real-time receivers placed on seasonal buoys in nearshore habitats along the south shore of Lake Erie from the Maumee River to the Cuyahoga River.

Detections from the nearshore array were downloaded in spring of 2025 providing a complete detection history from spring 2024-spring 2025 in these habitats. From this detection record we found no Grass Carp detections in new tributaries or Great Lakes basins. The largest movements detected for Grass Carp over this period were multiple individuals moving from the Sandusky River along Lake Erie's south shore as far east as Erie, PA. Satellite tagged Grass Carp within the Sandusky system provided locations within Sandusky Bay around the mouth of Muddy

Creek, habitat use that was not captured from acoustic tag receivers. Detections from tributary receivers were downloaded through the fall of 2025. Within the Sandusky River two potential spawning events were detected from telemetry and one of these spawning events was confirmed with egg collections on 5/16/25. We reviewed detections of five tagged Grass Carp harvested (4 active tags and 1 expired tags) from the Sandusky River during 2025 and one of these fish displayed resident life history movements within the Sandusky River. Movements from the other four suggested more mobile life histories. One harvested individual was detected in both the Sandusky River and Maumee River, and the other three harvested Grass Carp were detected in the Sandusky River and east (i.e., Huron River and Central Basin). This suggests while removal efforts or almost exclusively in tributary habitats a variety of invasive Grass Carp life histories are being removed from the population.

The telemetry task group has also continued tracking manuscripts related to Grass Carp telemetry data which has improved coordination among the researchers and managers. The task group will again provide data and analysis support, including a pre-sampling season meeting with the removal crews in April of 2026, and on-demand meetings throughout 2026 as needed. Planned and future telemetry analyses, related to coordination meetings or manuscripts, will help improve the capture and removal of Grass Carp by furthering our understanding of Grass Carp habitat-use, movements, and abiotic drivers of these patterns within Lake Erie and the surrounding waters.

Barriers Task Group

The Barriers Task Group was formed to coordinate research updates and examine the feasibility of using barriers/deterrents to restrict grass carp passage, including to spawning habitat. While research continues, mostly in the Mississippi River drainage, a feasibility study on the Sandusky River has shown that using these technologies is expensive and not likely to achieve the desired level of effectiveness to proceed with implementation. While the GCAC will continue to receive updates from barrier-related projects in the region, the Barriers Task Group has been placed on stand-down until uncertainty or technology improves.