

Appendix A
Asian Carp Control Strategy Matrix
May 2010

Action Item	Workgroup	Action	Agency	Point of Contact	Funding	Funding Source	Implementation Goal	Start Date	Planned Completion	Comments
2.1.1	MRR	Targeted Removal Within Chicago Area Waterways System (CAWS)	Rapid Response Team	John Rogner, IDNR	\$2,000,000	Funded GLRI Monies	Short-term	FY 2010 2nd Quarter	NA	Costs include rotenone, electrofishing, seining, netting, mobile BAFF, light-sound system, etc. Note: Costs may change depending on the number and geographic extent of areas to be treated.
2.1.2	MRR	Enhanced eDNA Testing, Contract Commercial Fishing, and Conventional Monitoring in "High Risk" Locations	IDNR, USFWS, USACE	John Rogner, IDNR	\$2,600,000	Funded USACE, USFWS, IDNR (\$900,000 for IDNR action will be GLRI monies)	Short-term	FY 2010 2nd Quarter	NA	Note from IDNR: This is entire length of Cal Sag below O'Brien all the way to barrier because eDNA was detected throughout. (\$0.5M USFWS for conventional monitoring and \$0.9M commercial fishing / electrofishing from IDNR). This action will continue into the next several fiscal years. Estimate by IDNR for O'Brien work: Based on 3 days/week from March through October, 33 weeks total, 99 days total, @ \$3,000/day (2 crews for entire length) - \$300,000.
2.1.3	MRR	eDNA Calibration Methodology and Increased Capacity	USACE, IDNR, USFWS	Col. Vincent Quarles, USACE John Rogner, IDNR Charles Wooley and Mike Weimer, USFWS	\$940,000	Funded USEPA/USACE \$340,000 GLRI \$600,000 USACE	Short-term	Ongoing	NA	Evaluate suite of validation technology for type and size of populations. \$3.5 million enhanced eDNA from USACE. This action may continue into the next several fiscal years.
2.1.4	IC	Construction of Des Plaines River and I&M Canal Barriers	USACE	Col. Vincent Quarles, USACE	\$13,200,000	Funded USACE 2010 GLRI monies	Short-term	April 2010	October 2010	Construction complete first quarter of FY 2011 (October to December 2011).
2.1.5	IC	Continued Operation of Demonstration Barrier I and Barrier IIA	USACE	Col. Vincent Quarles, USACE	\$4,750,000	Funded USACE appropriation	Ongoing	FY 2010	TBD	Barrier IIA maintenance is scheduled for October 2010.
2.1.6	IC	Expedited Construction of Barrier IIB	USACE	Col. Vincent Quarles, USACE	\$17,000,000	Funded USACE appropriation	Ongoing	October 2009	September/ October 2010	Scheduled completion in September 2010 and fully operational in October 2010. The goal is to place into operation before Barrier IIA requires maintenance shutdown in the fall of 2010.
2.1.7	IC	Contingency Plan for Rotenone Treatment for Maintenance Shutdowns	IDNR, USFWS, USCG, (RRT)	John Rogner, IDNR	\$5,000,000	Not Funded Federal funding may be needed if catastrophic failure of existing barriers occurs	Ongoing	FY 2010 4th Quarter	TBD	Low probability of occurrence as Barrier IIB is expected to be constructed and fully functional before next maintenance shutdown cycle.
2.2.1	IC	Final Efficacy Study Report	USACE	Col. Vincent Quarles, USACE	\$1,100,000	Funded USACE appropriation	Long-term	2009	TBD	USACE will complete Final Efficacy Study using Section 3061 WRDA 07 in September 2010 that will assess USACE structures and operational changes, assess preliminary impacts of any Federal actions for economic and environmental impacts, and study the feasibility of additional barriers and impediments in the CAWS including the Little Calumet River, Grand Calumet River, and Authority for implementation is Section 126 (if extended) or specific Congressional authorization. It is intended that NEPA requirements will be met.
2.2.2	IC	Great Lakes and Mississippi River Inter-Basin Study	USACE	Col. Vincent Quarles, USACE	\$1,000,000 (\$500,000 USACE \$500,000 GLRI)	Funded USACE base funding. \$0.5M - FY2010 GLRI allocation. \$200K is immediately available, \$300K remainder may be re-prioritized based on further discussions	Long-term	FY 2010	TBD	USACE will focus expedited first phase of Inter-Basin EIS on CAWS and migration of Asian carp and other AIS. Lock closure impacts will be evaluated as an alternative under this study. All information obtained through the efficacy studies will inform actions to be considered under this study. It is intended that NEPA requirements will be met. USACE expected to complete interim CAWS focused study in 2012.

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2.2.3	IC	Modified Structural Operations	USACE	MG John Peabody, USACE	TBD	Funded USACE appropriation	Long-term	FY 2010 2nd Quarter	September 2010	A three phased approach to change the manner in which existing CAWS structures such as locks and dams, sluice gates and pumping stations are operated, in combination with other management actions, to assist in impeding the migration of Asian Carp into the Great Lakes.
2.2.4	MRR/IC	Commercial Fishing for Removal Below Lockport	IDNR, USCG	John Rogner, IDNR	\$300,000	Funded GLRI monies	Long-term	FY 2010 3rd Quarter	TBD	An accepted principle of invasive species control is to remove propagule pressure that would otherwise hasten dispersal of fish into new areas and increase likelihood of invasion. This action will employ commercial fishermen in the pools below the barrier in a sustained program of catch and removal of Asian carp from the system, while minimizing detrimental effects on native fish species.
2.2.5	IC	Commercial Market Enhancement/Recruitment Overfishing	IDNR	John Rogner, IDNR	\$3,000,000	Funded GLRI monies	Long-term	FY 2010	TBD	Expand the commercial market for Asian carp in Illinois and beyond, with a portion of proceeds from carp fillets or other similar revenue stream going to fund ecosystem restoration and invasive species prevention. This market expansion may be focused on providing fillets for consumption in both domestic and overseas markets, utilizing Omega 3 oils, or using the carcasses as fertilizer. These monies would be utilized to provide funding opportunities to enhance marketing within the United States and export opportunities overseas. It is important to note that live Asian carp would not be transported.
2.2.6	IC	Investigation of Certification Requirements for Asian Carp Usage	IDNR, USDA, USAID	John Rogner, IDNR	NA	No funding necessary	Long-term	FY 2010 2nd Quarter	TBD	IDNR will work with Illinois Congressional delegation to identify certification procedures necessary for Asian carp to be declared suitable for use in US sponsored humanitarian relief efforts.
2.2.7	MRR	Feasibility Assessment of Inter-Basin Transfer of AIS	USGS	Leon Carl, USGS	\$500,000	Funded GLRI monies (GLRI template no. 69)	Long-term	FY 2010 2nd Quarter	TBD	Coordination of efforts with USACE to avoid duplication underway; possible hurdles of access issues
2.2.8	MRR	Tagged Fish Research to Test Barrier Effectiveness	IDNR, USFWS, USACE	John Rogner, IDNR	\$400,000	Funded GLRI monies	Long-term	TBD	TBD	DIDSON - 1 mobile unit and 1 recess mounted unit into canal at barrier.
2.2.9	MRR	Investigate Tow Boats and Barges as Potential Vectors	USCG, USEPA, IDNR, USFWS, USACE	Captain Lorne Thomas, USCG	\$500,000	Funded GLRI monies	Long-term	FY 2010 2nd Quarter	FY 2010 3rd Quarter	Funding source not identified. Since this workgroup will include towing industry representatives and the outputs of this study could result in regulatory action, due to FACA limitations, the USCG (or other federal agencies) cannot lead the workgroup.
2.2.10	IC	Assessment Study of Potential Impacts of Steel-hulled Barges on Fish Movement Across Electric Barrier II	USACE, USCG, INDR, USFWS	Col. Vincent Quarles, USACE, Capt. Lorne Thomas, USCG, Todd Main, IDNR, Mike Weimer, USFWS	TBD	Funded GLRI and base program monies	Long-term	June 2010	June 2011	Design and conduct experiments to test the effectiveness of the Electric Barriers IIA and IIB in the presence of steel-hulled barges and other vessels. The final report is expected to be completed in June 2011.
2.2.11	MRR	Research of Potential Asian Carp Access to Vectors on Barge Decks and Between Lashed Barges	USFWS, IDNR, USCG	Mike Weimer, USFWS, Todd Main, IDNR, Capt. Lorne Thomas, USCG	TBD	Funded GLRI and base program monies	Long-term	June 2010	October 2010	Form interagency/industry task force to validate or disprove the access paths of fish on decks and fish trapped between lashed barges. The task force must establish factual evidence that supports or refutes the viability and effectiveness of these access pathways.

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2.2.12	CO	Investigation of Northeast Illinois' Bait Shops	IDNR	John Rogner, IDNR	NA	No funding necessary	Long-term	TBD	TBD	IDNR will conduct a friendly investigation of bait shops in Northeast Illinois to identify whether Asian carp are collected and sold as bait in the Chicago area.
2.2.13	MRR/IC	Efficacy Study for Toxic Zones Using Plant Effluent	MWRD		NA	No funding necessary	Long-term	FY 2010	FY 2013	Create a toxic zone through the bypass of ammonia-laden primary effluent to the CSSC at the Stickney plant and the Little Calumet River at the Calumet plant to create a toxic zone to kill fish migrating upstream. The two zones would block passage to the lakefront control structures. Full-scale testing would be included in the study.
2.2.14	MRR/IC	Increased Lacey Act Enforcement of Illegal Transport of Injurious Wildlife	USFWS	Charles Wooley and Mike Weimer, USFWS	\$400,000	Funded USFWS Allocation of GLRI monies (GLRI template no. 24)	Long-term	FY 2010	TBD	Support Federal law enforcement activities to enforce the Lacey Act, and to work in coordination with State LE partners to enforce State statutes and regulations related to AIS prevention and control. Support efforts to finalize all requirements in advance of proposed rulemaking to list Bighead carp as "injurious species" under the Lacey Act.
2.2.15	IC/MRR/CO	State and Interstate AIS Management Plans	USFWS, 8 states	Charles Wooley and Mike Weimer, USFWS	\$11,000,000	Funded USFWS Allocation of GLRI monies (GLRI template no. 189)	Long-term	FY 2010	TBD	\$11 million for enhanced support of State and Interstate AIS Management Plans and for support of State-led rapid response actions under new rapid response plans developed by states and approved by the AIS Task Force. Impediments: 25% non-federal match required. IDNR portion to include \$200,000 for Illinois to advance public outreach. IDNR adds 2 employees and will continue to update plan.
2.2.16	IC/MRR/CO	Competitive Funding Opportunities	USEPA, USFWS	Bill Bolen, USEPA Charles Wooley and Mike Weimer, USFWS	\$8,800,000	Funded USFWS Allocation of GLRI monies	Long-term	FY 2010	FY 2010	State to assist in ecological separation – complement to USACE Inter-Basin Study, specifically assessing State interests/needs for ecological separation.
2.2.17	MRR/IC	Understanding Asian Carp and Bluegreen Algae Dynamics	USGS	Leon Carl, USGS	\$225,000	Funded GLRI monies	Long-term	FY 2010	June 2012	Blue green algae (primarily Microcystis) blooms resulting from the dreissenid invasion may provide an excellent food source for bighead carp, enhancing their invasion. Noxious blue green algae blooms can under some circumstances be enhanced by interaction with bighead carp. The risk of enhanced noxious algal blooms, and the possibility that use of blue green algae blooms might enhance bighead carp invasiveness, could be assessed by modeling, parameterized with mesocosm experiments that fill in some of the holes in our understanding of this relationship.
2.2.18	MRR/IC	Use of Seismic Technology to Divert or Eradicate Invasive Asian Carp	USGS	Leon Carl, USGS	\$200,000	Funded GLRI monies	Long-term	Spring 2010	TBD	This study will focus on lethal and sub-lethal effects of seismic technology to divert or eradicate invasive Asian carp as a means to inhibit passage and reduce recruitment. Initial dose response studies will determine the effects of different sound wave frequencies on various age classes of Asian carp at a range of distances from the sound source. The magnitude of the sound wave and particle velocity will be measured in order to quantify fish response to sound impacts. Initial and delayed lethality will be assessed, as well as sub-lethal evading behaviors.

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2.2.19	MRR/IC	Expand Research on the Identification of Asian Carp Attraction Pheromones	USGS	Leon Carl, USGS	\$300,000	Funded GLRI monies	Short-term	FY 2010 3rd Quarter	TBD	Better define the active pheromone components; additional research to define the response of Asian carp to pheromone products; develop conceptual models in which pheromones could be integrated into management programs to control or limit Asian carp; develop methods to synthesize active pheromone components. Timely funding will allow work to begin in current field season.
2.2.20	MRR/IC	Identify Potential Compounds for Inclusion in a Toxicant Screening Program to Identify Potential Selective Toxicants for Control of Asian Carp	USGS	Leon Carl, USGS	\$300,000	Funded GLRI monies	Short-term	FY 2010 3rd Quarter	TBD	USGS will develop cooperative research and development agreements to access pharmaceutical or agrochemical company chemical libraries to identify potential candidate toxicants. Potential toxicants will be identified either through structure activity relationships or through known activity models. Studies will be required to assess selective toxicity of candidate toxicants between Asian carp versus native fishes. Additional data sets would be required to support registration. Efforts would be made to target those compounds/formulations with present agricultural/pesticide use.
2.2.21	MRR/IC	Evaluate Physical Methods to Disrupt Asian Carp Spawning Behavior and Decrease Egg Viability	USGS	Leon Carl, USGS	TBD	Funded GLRI monies	Short-term	FY 2010 3rd Quarter	TBD	Research will be conducted to evaluate potential methods to disrupt Asian carp spawning aggregations and to alter Asian carp egg viability. Identification of sound wave amplitude and frequency which elicit silver carp avoidance behavior may disrupt spawning aggregations and limit recruitment; Evaluation of Asian carp egg response to electrical fields, sonication, etc. to develop methods to reduce egg viability while the eggs drift downstream of Asian carp spawning areas. Timely funding will allow work to begin in current field season.
2.2.22	MRR/IC	Characterization of Organism-Level Target Delivery Sites in Native Aquatic Animals	USGS	Leon Carl, USGS	\$200,000	Funded GLRI monies	Short-term	FY 2010 3rd Quarter	TBD	Research will be conducted to identify and characterize potential bioactive agent delivery sites within Asian carp including the gill, skin, and gastrointestinal tract. Research will focus on collection of data on the physiological characteristics of both Asian carp and native species (e.g., enzyme, protein, lipid, carbohydrate components, pH) to provide an understanding of factors that might affect delivery of a bioactive agent. While some basic research is available, additional basic and applied research will lead to development of optimized delivery components to enhance selectivity and sensitivity. Research planned to characterize Asian carp gastrointestinal pH and digestive enzyme profiles will be expanded to include identification and characterization of native fish gastrointestinal tracts.
2.2.23	MRR/IC	Great Lakes' Tributary Assessment for Asian Carp Habitat Suitability	USGS	Leon Carl, USGS	\$275,000	Funded GLRI monies	Short-term	FY 2010 3rd Quarter	September 2013	Tributaries that would be suitable for bighead carp spawning need to be identified to focus management efforts for evaluating invasion success, as well as sites to launch control actions. Recent USGS research has determined the developmental stage at which bigheaded carp larvae are capable of swimming and migrating laterally from flowing water into nursery habitats. This knowledge can be used in a model of river velocity and temperature to describe an actual river length required and, taken together with the temperature and velocity regimes of individual rivers, can be used to more accurately determine which rivers are suitable for spawning and recruitment of bigheaded carp.

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2.2.24	MRR/IC	Risk Assessment of Asian Carp Establishment in the Great Lakes, Based on Available Food Sources	USGS	Leon Carl, USGS	\$250,000	Funded GLRI monies	Short-term	FY 2010 3rd Quarter	June 2014	Bighead carp have yet to become established in waters as oligotrophic as the open waters of the Great Lakes. However, under varying conditions bighead carp have been observed to diversify their diet beyond their preferred pelagic plankton sources and feed on detritus. Feeding studies are needed under controlled conditions where the flexibility in the carp diet can be defined thus establishing their ability to maintain large populations in the Great Lakes.
2.2.25	MRR/IC	Technologies Using Oral Delivery Platforms for Species-Specific Control	USGS	Leon Carl, USGS	\$1,553,000	Funded USEPA FY 2010 GLRI monies (GLRI template no. 66)	Short-term	FY 2010 2nd Quarter	TBD	Development of a targeted oral delivery platform using novel incorporation technologies that have the capacity to deliver biocides to specific target sites in AIS may increase the selectivity and specificity of both current and potential new management chemicals. This large integrated project will focus on developing these approaches for application throughout the Great Lakes. In 2010, work will focus on initiating development of new integrated pest management approaches for Asian carp and other invasive aquatic species of concern to Great Lakes managers.
2.2.26	IC	Study Efficacy of Reducing Asian Carp Food Source Through Nutrient Removal	USEPA, IEPA, USGS	Janet Pellegrini, USEPA	\$1,000,000	Funded GLRI monies	Long-term	FY 2010	FY 2012	Nutrient reductions could be accomplished by removing phosphorus and nitrogen (using advanced biological nutrient removal processes) from WWTPs that discharge into the CAWS/Upper Illinois Watershed.

NOTES:

†	To highlight immediate actions to be taken - Short-term: Feb. - May 2010, Long-term: beyond May 2010, Ongoing	Monitoring and Rapid Response
AIS	Aquatic Invasive Species	MWRD Metropolitan Water Reclamation District of Greater Chicago
BAFF	Bio-acoustic Fish Fence	NA Not Applicable
CAWS	Chicago Area Waterway System	NEPA National Environmental Policy Act
CO	Communication and Outreach	NGO Non-governmental Organization
CSSC	Chicago Sanitary and Ship Canal	NOAA National Oceanic and Atmospheric Administration
DIDSON	Dual-frequency identification sonar	OE Outreach and Education
eDNA	Environmental DNA (Deoxyribose Nucleic Acid)	RRT Rapid Response Team
EIS	Environmental Impact Statement	SPA Sound Projector Array
EPA	United States Environmental Protection Agency	TBD To Be Determined
FY	Fiscal Year	USACE United States Army Corps of Engineers
GL	Great Lakes	USCG United States Coast Guard
GLRI	Great Lakes Regional Initiative	USGS United States Geological Service
IC	Invasion Control	USFWS United States Fish and Wildlife Service
IDNR	Illinois Department of Natural Resources	WRDA Water Resources Development Act