

2015 September Summary

Bottom Line: Monitoring occurred in the CAWS and upper Illinois Waterway downstream of the Electric Dispersal Barrier in August. **NO BIGHEAD CARP OR SILVER CARP were found in any new locations upstream and downstream of the Electric Dispersal Barrier.**

Seasonal Intensive Monitoring

Seasonal Intensive Monitoring (SIM) took place above the electric dispersal barrier the weeks of September 14th and 21st. Electrofishing and commercial netting occurred in the North Shore Channel, North and South Branches of the Chicago River, CSSC, Cal-Sag Channel, Little Calumet River, Calumet River and Lake Calumet.

Electrofishing:

- Crews from IDNR, USACE and USFWS completed 217 electrofishing runs at fixed and random sites (54.25 hours total).
- Crews collected 18,926 fish of 51 species and 2 hybrid groups.
- Sixty-nine state threatened Banded Killifish were collected.

Commercial Netting:

- Contracted commercial fishers along with assisting IDNR biologists set 24.5 miles of net (252 sets) at fixed and random sites.
- Crews collected 392 fish of 12 species and 1 hybrid group.
- **No Bighead Carp or Silver Carp were captured or observed during SIM.**

Fixed and Targeted Site Sampling Downstream of the Electric Dispersal Barrier

Commercial Netting:

- Contracted commercial fishers along with assisting IDNR biologists set 8.2 miles of net (53 sets) at fixed and targeted sites in the Lockport, Brandon Road and Dresden Island Pools (including Rock Run Rookery) during the month of September.
- Crews collected 146 fish of 9 species.
- Three Bighead Carp were collected in Rock Run Rookery and one Bighead Carp was collected in Mobil Bay.
- Twelve Bighead Carp and one Silver Carp were collected in the Dresden Island Pool downstream of the I-55 Bridge.
- **No Bighead Carp or Silver Carp were captured or observed in the Lockport or Brandon Road Pools.**

Hoop and Mini Fyke Netting:

- Crews from IDNR set and pulled 16 hoop nets (6' diameter) and 16 mini fykes in Lockport, Brandon Road, Dresden Island and Marseilles Pools during the week of September 28th.

- Crews collected 45 fish of 8 species during hoop net sampling and 405 fish of 24 species and 1 hybrid group during mini fyke sampling.
- One Silver Carp and eight Bighead Carp were collected during hoop net sampling in the Marseilles Pool.
- **No Bighead Carp or Silver Carp were captured or observed in the Lockport or Brandon Road Pools.**

Barrier Defense Asian Carp Removal Project

Barrier Defense occurred the week of September 7th. Modified from previous years, Barrier Defense specifically takes place in the Marseilles and Starved Rock Pools. Also in 2015, contracted commercial fisherman will be deploying and fishing modified 6-foot diameter hoop nets in the main channel border and side channel habitats as conditions allow. These habitats have been difficult to fish with gill and trammel nets. Below is a summary of all Barrier Defense activities for 2015 (along with 2014 for comparison):

QUICK SUMMARY:	2014	2015
Number of Days Fished	43	52
Number of Net Crew Days	227	252
Yards of Net Fished	397,450	343,570
Miles of Nets Fished	225.8	195.2
Number of Hoop Net Sets	103	118
Number of Bighead Carp	9,562	6,702
Number of Silver Carp	39,120	76,551
Number of Grass Carp	421	569
Number of Asian Carp	49,103	83,822
Tons of Bighead and Silver Carp Harvested	242.9	292.12

Evaluation of Gear Efficiency and Asian Carp Detectability

INHS targeted age-0 and age-1 Asian carp with multiple gears at the Lily Lake backwater and the main channel adjacent to Lily Lake during September 21-23, and at Havana and the Matanzas Lake backwater during September 28-30. Gears deployed included floating small-mesh gill nets, mini-fyke nets, beach seines, small-mesh purse seines, pulsed-DC electrofishing, and hydroacoustic transects. This sampling took place in conjunction with U.S. Fish and Wildlife Service personnel evaluating the use of a Mamou trawl and a Paupier net for sampling juvenile Asian carp as part of the Gear Development and Evaluation project. Gear evaluation efforts captured 221 Asian carp, including 99 age-0 (98 – 182 mm) and 22 age-1 (225 – 337 mm) individuals. Small-mesh gill nets were effective at capturing age-0 (n = 14) and age-1 (n = 15) Asian carp at the Lily Lake backwater, but captured few individuals at other sites (n = 3 total). Similarly, small-mesh purse seines captured 6 age-0 and 2 age-1 Asian carp at Lily Lake, but did not capture any juvenile Asian carp at other sites. Mini-fyke nets were effective at capturing juvenile Asian carp at main channel sites (n = 2 at Lily Lake main

channel, n = 61 at Havana), but did not capture any juvenile Asian carp at backwater sites. Pulsed-DC electrofishing captured 15 age-0 Asian carp at Havana, and a single age-1 individual at both the Lily Lake backwater and main channel sites, but otherwise was only effective at capturing adult silver carp (n = 88). Beach seines only captured a single age-0 Asian carp at Havana, but not at any other site. All juvenile Asian carp were identified as silver carp, except for 3 age-0 bighead carp and 2 age-0 hybrid Asian carp captured at Havana

Telemetry Monitoring Plan

USACE biologists downloaded data from 32 VR2W receivers system wide in the CAWS and Upper IWW from 14 through 18 September 2015. VR2W receiver data underwent preliminary data analysis to determine if there was any Asian carp movement upstream of previously known locations or if any surrogate fishes from below the barrier were found above the barriers.

Five transmitters were detected on receivers upstream of the barrier for a total of 13477 detections. Four of these transmitters were implanted into Common carp which were released upstream of the barriers. One of the transmitters was implanted into a Common carp released below the demonstration barrier and above Barriers IIA and IIB. This fish was able to move upstream past the demonstration barrier when it was taken offline in May. No tagged fish were found to have crossed upstream through Barrier IIA or IIB. Preliminary analysis of the receiver at the Romeoville Road Bridge indicated no downstream movement of fishes through the electric dispersal barriers from upstream. Fourteen transmitters were detected within the Brandon Road Pool from 13 Common Carp and one Freshwater Drum. No Asian carp were detected in this pool indicating no movement upstream through the Brandon Road Lock.

Within the Dresden Island Pool the furthest upstream detections of Asian carp occurred approximately 1 mile upstream of the Rock Run Rookery connecting channel. Four Bighead Carp were recorded at this location with three from USACE telemetry and one from SIUC telemetry projects. Further analysis is ongoing on these telemetry results to describe patterns of movement in relation to environmental parameters and habitat use.

Fish Suppression and Clearing in Support of Barrier Maintenance

Within the Month of September the Dispersal Barrier System continuously maintained power to the water at one or more barrier arrays resulting in no direct opportunities for fish passage. There were 12 instances in which Barrier IIB was switched to emergency power in which a transfer of power was made from utility to generator power. A manual switch to generator power at Barrier IIB during these events includes a 30 second delay in power to the water but is a precautionary measure to ensure a longer outage time does not occur in the case of an unexpected loss of utility power. Barrier IIA narrow array was continuously operated under utility power during each of these instances. USACE increased the voltage output setting at Barrier IIB from 2000 volts to 2200 volts on 3 September to ensure a constant maximum voltage gradient of 2.3 V/in is being

achieved at the surface of the canal over the narrow array. This modification was made in response to monitoring results indicating a slight decrease in maximum voltage gradient at the surface to 2.1 V/in under the 2000 volt setting. Barrier IIA is expected to undergo a similar adjustment in voltage output following the planned maintenance event described below.

A planned maintenance event was initiated at Barrier IIA on 22 September which required the shutdown of Barrier IIA through the end of the month and into early October. During this time, Barrier IIB maintained power to the water continuously. Several Barrier IIA repairs were made including the installation of several switch gear components and new rooftop, HVAC units. This shutdown of Barrier IIA has allowed an opportunity for fish from downstream to move up to Barrier IIB. These fishes may become trapped between the barriers as Barrier IIA is re-energized and could then proceed upstream during the next shutdown of Barrier IIB. The MRWG is convening in October before the next planned shutdown of Barrier IIB to assess the risk for Asian carp presence between the barriers and deploy clearing or monitoring measures as necessary.

The operational settings for Barriers IIA prior to the maintenance shutdown was 2000 V input at the narrow array electrodes, 34 Hz frequency and 2.3 ms pulse duration. Barrier IIB settings through September were 2200 V input at the narrow array electrodes (780 V at wide array), 34 Hz frequency, and 2.3 ms pulse duration. Heavy monitoring of the waterway continues with efforts from multiple resource agencies which indicate that Asian carp presence within Lower Lockport pool remains low.

Understanding Surrogate Fish Movement with Barriers

Current Floy Tag results

Fish Tagged & Recaptured

- Bigmouth Buffalo – 73
- Black Buffalo – 52
- Common Carp – 1109
- Common X Goldfish Hyb. – 29
- Goldfish – 4
- Smallmouth Buffalo – 860

Total – 2,127

Recapture Totals

- Lockport Pool – 11 Common Carp
- Brandon Pool – 49 Common Carp, 3 Smallmouth Buffalo & 1 Common Carp
- Dresden Pool – 23 Smallmouth Buffalo, 21 Common Carp & 3 Bigmouth Buffalo
- Rock Run – 10 Smallmouth Buffalo, 2 Bigmouth Buffalo, 2 Common Carp & 3 Black Buffalo

Total – 128 recaptures

Fish Movement

- 58 recaptures by Caudal Fin but didn't have tags (No data on movement)
- 65 recaptures had tags but showed no movement between Barrier/Dam
- 5 recaptures had tags and showed movement downstream through lock and dams

Notable

- 1 Smallmouth buffalo was tagged in Rock Run Rookery and travelled through the connection into Dresden before recaptured
- 1 Bigmouth buffalo was tagged in Rock Run Rookery and travelled through the connection and was captured by a bow fisherman upstream the Kankakee river near Wilmington
- 1 Common carp was tagged in Lockport Pool and travelled downstream through the Lockport Lock and Dam and was recaptured in Brandon Pool the next day
- 1 Common carp was tagged in Dresden Pool and travelled downstream through the Dresden Lock and Dam and the Marseilles Lock and Dam before being recaptured in Sheehan Island
- 4 fish that were tagged have been recaptured more than once

Asian Carp Gear Development and Evaluation

The Columbia FWCO sampled the Marseilles and Starved Rock pools for three weeks in September 2015 and collaborated with the Wilmington USFWS office for one week in the Starved Rock Pool. Efforts targeted juvenile invasive carp with the electrified paupier, surface trawl, traditional boat electrofishing, and the dozer trawl. Table 1 summarizes effort and fish caught in each pool. No juvenile invasive carp were captured in the Marseilles Pool but many were captured in backwater and marinas of the Starved Rock Pool (Figure 1). All fish were captured in locations where juveniles were known to exist; however, one juvenile measuring 203mm was captured approximately 250m downstream of the Marseilles lock. This is approximately 2 miles further upstream than any juvenile has been previously caught (Figure 2). Efforts captured two size classes of juvenile Silver Carp with the larger size class ranging from 269-340mm and the smaller size class ranging from 138-226mm. Three juvenile Bighead Carp measuring approximately 450 mm were also captured.

Table 1. Effort and number of juvenile Silver Carp captured in the Marseilles and Starved Rock pools with three sampling techniques with September 2015.

	Number of Juvenile Silver Carp (136-226mm)	Effort (min)
Electrified Paupier	469	545
Marseilles	0	99
Starved Rock	469	446
Surface Trawl	6	206
Marseilles	0	137
Starved Rock	6	69
Electrofishing	5	176
Marseilles	--	--
Starved Rock	5	176
Dozer Trawl	0	69
Marseilles	--	--
Starved Rock	0	69

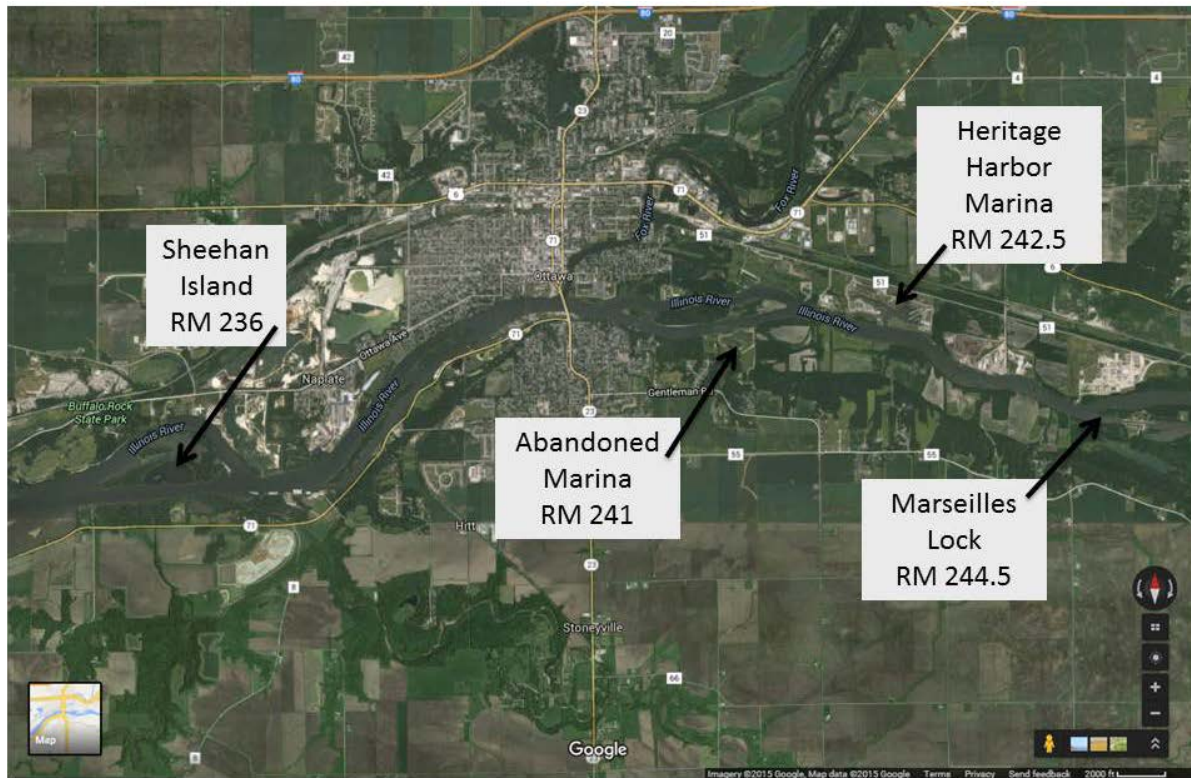


Figure 1. Map of juvenile Silver Carp capture locations in September 2015 in the Starved Rock Pool.



Figure 2. Juvenile Silver Carp measuring 203mm caught in the Starved Rock pool downstream of the Marseilles lock (41.32868, -88.75505).

Larval Fish and Productivity Monitoring in the Illinois Waterway

INHS conducted ichthyoplankton sampling at 12 sites located throughout the Illinois Waterway during September 1-3 and September 15-17. Four larval fish samples were taken at each site, and zooplankton and water quality samples were also collected. Very few larval fish were observed in samples from September. Subsamples of large-diameter eggs collected from the upper Illinois Waterway in previous months were submitted for genetic confirmation and results of these tests will be reported once available

Identifying Movement Bottlenecks and Changes in Population Characteristics of Asian Carp in Illinois River

Hydroacoustics

Hydroacoustic surveys were undertaken directly before and after harvest in the East Pit (Marseilles pool) on 8 Sep. SIU researchers also took subsample measurements of the catch, to infer species composition and size distributions of the acoustics. Data analysis is in progress.

Beginning 17 Sep, all accessible habitats in the Starved Rock, Marseilles and Dresden pools were surveyed, as part of our annual fall acoustics program that has been ongoing since 2012. It is anticipated that the lower river will be surveyed in October, and analysis of all data will begin after that.

Telemetry

The final assessment of ranges of stationary receivers around Starved Rock Lock & Dam was completed. This provided range testing information during low flow conditions. Previous range testing had been completed at medium and high water levels. Range testing indicates that the stationary receivers currently deployed provide complete coverage of the areas around Starved Rock Lock & Dam.

Additional Silver and Bighead Carp will be tagged during October in the area around Starved Rock Lock & Dam to further increase numbers of tagged individuals near this detailed telemetry array. Small Silver and Bighead Carp may also be tagged, if they can be collected around Starved Rock Lock & Dam.

Note: The ILDNR have expressed an interest in collected fish between 4 – 5 inches in length (~101 – 152 mm) as fish that may have the potential to challenge the CAWS electric barriers. However, no Silver Carp of this size were collected above the Peoria pool. Several Silver Carp in this size range were collected during standardized sampling in August. 9 individuals of this size were collected in the LaGrange pool and the Peoria pool respectively.

Monitoring Fish Abundance and Spatial Distribution in Lockport, Brandon Road, and Dresden Island Pools and the Associated Lock and Dam Structures

A stationary split beam hydroacoustic system utilizing 430 and 120 kHz transducers has been collecting data on fish density and movement directly above the Brandon Road Lock chamber 24 hours a day throughout September.

Monitoring Fish Abundance, Behavior, Identification, and Fish-Barge Interactions at the Electric Dispersal Barrier, Chicago Sanitary and Ship Canal, Illinois-USFWS

Stationary dual DIDSON and underwater camera deployments were conducted at the EDB IIB narrow array during September to observe fish behavior near the barrier. Sixty-three 10 minute observation events occurred this month. Data processing is ongoing. In addition; fish sampling events occurred in association with this work.

Distribution and Movement of Small Asian Carp in the Illinois Waterway

During the month of September, USFWS Wilmington sub-office conducted the following efforts, using mini-fykes, boat electrofishing, dozer trawls, and push trawls to search for small Asian carp (<200mm) in the Illinois River. Six small Asian carp were captured in two backwater areas of Starved Rock pool (130-154 mm TL).

River/Pool	Gear	Effort
Dresden Island	Mini-fykes (net nights)	10
	Electrofishing (runs(mins))	10(128)
Marseilles	Electrofishing (runs(mins))	4(46)
	Dozer Trawl (runs)	9
Starved Rock	Mini-fykes (net nights)	12
	Electrofishing (runs(mins))	11(111)
	Push Trawl (runs)	8
Kankakee River	Mini-fykes (net nights)	5
	Electrofishing (runs(mins))	4(57)
	Dozer Trawl (runs)	5

A FWS crew from Columbia FWCO also captured 17 small Asian carp (135-150 mm TL) in upper Starved Rock Pool using electrified paupier (Figure 1). All were captured in Heritage Harbor Marina, which is just over 2 miles away from the Marseilles Lock (41.34127, -88.78805; Figure 2). Additional specimens were captured throughout September by Columbia FWCO.



Figure 1. Small silver carp captured by electrified paupier in Heritage Harbor in Starved Rock Pool during September 2015. Credit: Skyler Schlick USFWS



Figure 2. Location of Heritage Harbor Marina, in Starved Rock Pool, relative to Marseilles Lock.

Alternate Pathway Surveillance in Illinois - Law Enforcement

The invasive species unit identified the Plant Chicago as an unpermitted aquaculture facility raising and selling a restricted species (Tilapia). The building previously housed 3 other aquaponic facilities that either went out of business or moved. ISU inspected the building and records from the Plant Chicago. Appropriate enforcement action was taken and the business was brought into compliance.

The invasive species unit inspected Scoville Fish Hatchery in Barrington, IL as part of the random commercial inspection program. No violations were detected and an updated report was filed on the facility.





Impacts of Carbon Dioxide on Non--target Species

Behavioral impacts to freshwater fishes

The goals of our projects have been to determine if fish behavior is altered by exposure to elevated CO₂. During September, work was undertaken to test behavioral (i.e., personality, lateralization) traits for Bluegill exposed to elevated CO₂. As the study is still currently active, preliminary data will be shared at a later date. We are also exploring whether accelerometers to understand energy expenditure of fish exposed to prey cues is a viable tool to understand potential effects of exposure to elevated CO₂.

Behavior and physiology of fish exposed to ozone

Ozone has been explored as another non--physical barrier to fish movement in freshwater. We added ozone to a range of freshwater sources to gain an understanding of the maximum attainable level of ozone using a commercially available generator. We then exposed bluegill to this level of ozone and measured behavioral responses and have taken physiological samples to test for potential tissue--level changes in stress indicators. Laboratory work will occur this fall/winter and data will be presented in the final report.

Behavior of CO₂ in water

To inform potential deployment of CO₂ at a large scale to be used as a fish barrier, we have recently explored how CO₂ behaves in a variety of settings. We have injected CO₂ into tanks of multiple sizes, and under varying conditions (e.g., air bubbles, no bubbles, static, flowing, temperature etc.) and have measured water pCO₂ over set periods of time. A draft report is currently being prepared. Furthermore, we completed a short study to compare three techniques for measuring CO₂ in water and have begun to understand the amount of CO₂ potentially needed to raise ambient water to barrier levels of CO₂. We are currently also completing a similar study to test whether dissolved oxygen is directly influenced from the injection of CO₂.

Physiological effects of CO₂ exposure on mussels

Through collaborations with UMESC, we have also been tasked with understanding how CO₂ exposure affects the physiology of freshwater mussels. In August, we completed analysis of genes associated with shell growth and stress in *Fusconaia flava* exposed to short- and long-term exposure to elevated CO₂.

Two additional experiments have begun to first assess the impacts of two levels of CO₂ on *Lampsilis siliquoidea* and *Amblema plicata* over a 28 d period with a 14 d recovery, and second, to assess the effects of fluctuating levels of CO₂ on three species of freshwater mussels. In addition, we have been researching other assays to look at physiological endpoints including total alkalinity, and the enzyme activity of key players involved in ion and acid base regulation. The studies are currently ongoing and we anticipate a completion by late fall/early winter.